GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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EDITORIAL NOTES.

Scotland First.

THROUGH the courtesy of the Secretary (Mr. J. W. Napier, of Alloa), we were able last week (p. 555) to publish the annual report of the Scottish District of the National Gas Council. It was presented at the annual meeting of members, on which occasion the new Chairman, Mr. W. E. Whyte, of Lanarkshire, presided. It is fitting that he should be occupying the chair at the present juncture, because, if anyone in Scotland can speak authoritatively as to what can be done in the way of developing by amalgamation the economies and efficiencies of gas supply, it is Mr. Whyte, who can cite first-hand the experiences and data which Lanarkshire has yielded, to the advantage of the gas undertakings concerned and the communities served. An important section of the annual report is that dealing with the subject of strengthening the position of the industry throughout the country—a matter which has been receiving the close and earnest attention of the National Gas Council, and facilitating provisions for which will appear in the Bill which is to be promoted with the view of revising the general powers of gas undertakings. It is also a question in which the "JOURNAL" can claim to have taken prominent part.

The Committee of the Scottish District tell us that the placing on the Statute Book of the Electricity (Supply) Act emphasizes the necessity of gas undertakings immediately moving to meet the new competition by increasing their efficiency, and by reducing the price of gas to the public. This is not a case of fright or stampede. It is simply prudent defence in encountering fresh conditions. When business men have pre-knowledge of the advent of new competitive conditions, they do not wait before making a move to ascertain whether or not they will affect their interests. The gas industry have had good warning of a reconstruction of their competitors' circumstances in the matter of current generation; and therefore it is their duty to take advantage of the opportunity to set their house in order ready to meet the new state. No matter what our private opinions may be as to the results of the electricity concentration scheme, it is merely politic to give credence to the anticipations of the authors, and to take action accordingly. That generating costs, regarded alone, will be reduced, there can be no manner of doubt; that the gain will be discounted by transmission and transformation expenses is a common belief, but not a definitive experience. No risks must be taken. Scotland is to be in the van in the establishing of a generation consolidation scheme under the new legislation; and therefore the representative men of Scottish gas undertakings know it is up to the administrators of them not to delay taking effective action. Even assuming that the Government scheme does not ultimately put the electricity industry into a better competitive position, the plans that the gas industry devise and apply to effect greater economy and efficiency will be of considerable benefit in increasing stability, through enlarged trading power and improved service to the community. Nothing will be lost, but much will be gained. There is every inducement to-day to the gas industry to provide for the transmission of a higher efficiency in service throughout the land, by bringing about the unification of production at appropriate centres, from which there can be economical transference of gas outwardly.

There are three methods of accomplishing this: By schemes of amalgamation; by supply of gas in bulk; by joint working of undertakings. The report of the Scottish District of the National Gas Council says it is fully appreciated that there is a difficulty in devising a method for approaching this matter. There are also obstructions of administrative origin; and we all know their nature. But difficulties must not dam back the endeavour to do what we know is right; indeed, the report says every effort should be made to cope with the question, which is of paramount importance. There are no difficulties—technical or otherwise—in this which are not inherent as much to electricity as to gas supply; and yet the Electricity Board and Commissioners are attacking them, and on a scale larger than is proposed voluntarily to be carried out in the gas industry. The only difference between the two is that in the one case the reorganization is general and compulsory; in the other, it is a matter for mutual and voluntary action in the common interests. In the gas industry we want no compulsion other than that provided by the dictates of self-protection and the highest level of public service—everywhere. It is suggested in the report that a Committee may be appointed for the purpose of surveying the country as a whole, and of preparing a scheme or schemes for voluntary amalgamations or joint working between neighbouring undertakings. This is wise. It will supply a starting-point for real and, we hope, effective action. Without this, it is safe to say that the smaller undertakings will suffer severely. So far as many of the large towns are concerned, we do not think electricity will derive any substantial benefit in the matter of price from the centralization of production; but the managements of the supply undertakings will be in a position to concentrate on the development of business, which ability will also have to be countered by increased gas activity, and by better and more economical service than is offered by the competitor.

Coke Testing.

MUCH work has been done on the ignitibility and combustibility of coke; but the methods of carrying out the investigations have had such wide differences, and in some cases have been of a somewhat crude order, that it is time efforts were made to devise a standard test, in order that there may be comparability between the various results. Some interesting work on the subject is described in a contribution published in the "Journal of the Society of Chemical Industry," and reproduced by us this week, by Mr. T. F. E. Rhead, M.Sc., F.I.C., Chief Chemist of the Birmingham Corporation Gas Department, and Mr. R. E. Jefferson, M.Sc., A.I.C. Having realized that there is need of a method of coke testing which could be universally adopted, they set about making research into the matter with that end in view. As will be seen, the article considers the factors affecting the coke fire and the progress of burning. Following this the authors mention that, having made a survey of the methods applied in prior investigations, they determined to explore the possibilities of one based on the continuous weighing of the fire, using for the work a brazier, which has several good points in its favour. In making this selection, the investigators had in mind that what is desired is to obtain, in

the best possible circumstances, the actual behaviour of the coke itself, and not the behaviour of coke in normal grates, with their mass of heat-absorbing metal and refractory material, which have a large influence on the conduct of the fuel. Various makes of brazier were used by Messrs. Rhead and Jefferson, and the work is not yet complete. Therefore, we merely call attention to it in order that those gas technicians who are interested—and who among them is not in these days?—may not overlook the instructive course of this piece of work, and the results which have so far been achieved. The results are highly encouraging to the workers, though their experiments have demonstrated the many factors involved, and the difficulties which have to be overcome, in devising a standard test on even such lines as they are pursuing. It is a good essay, however, to get from crude methods to something more reliable; and, if success is achieved, it will provide more useful information concerning the behaviour of the coke fire than has been obtained in the past. The experimenters are satisfied of this, though they hesitate to express any opinion as to whether the difficulties due to the many factors involved are likely to be overcome to a degree sufficient to set-up a standard test on the lines upon which they are working. As seen in the summary towards the end of the account of the work, Messrs. Rhead and Jefferson indicate that the brazier in its various modifications was suspended from one arm of a sensitive scale, and the coke in various qualities and size was allowed to burn to extinction (under natural draught) in various modifications of the brazier. It is pointed out that the loss in weight involves moisture and volatile matter, as well as loss by combustion; but records of the relative radiation intensities from the sides of the fires have been found helpful in interpreting results. The important influences of size of coke, grade, height of fire, and natural draught so frequently experienced, but the effects of which are not always appreciated in domestic practice, are clearly demonstrated by the results. The duration and extent of burning (involving among other factors the influence of ash) and the maximum rate of burning are clearly shown for the different sizes of grade and quantities of coke used. However, though the authors are conscious of the many factors involved, and the difficulties to be overcome in attaining the object of their quest, they are persuaded by their work so far that the method is capable of giving much valuable information concerning the behaviour of the coke fire. We hope they will be able to pursue their investigations, and ultimately attain positive success.

The Sign of the Blue Star.

The gas industry of the United States is more enamoured to-day of the testing laboratory of the American Gas Association than it probably was at its inception. It has cause to be. Its bounds of usefulness and influence have grown; and both the gas supply industry and the appliance manufacturers are pledged to make its work effective in the common interests. Three or four articles have appeared in the American Gas Association "Monthly" describing what has been done during the first twenty months of the existence of the laboratory—the second anniversary of its birthday being on July 31. Its equipment has been built-up on a comprehensive scale, and is being extended as new work demands; and valuable results have already issued from it. Its great mission is to eliminate unworthy appliances, and to set up patronage and demand for nothing but laboratory approved appliances. Confidence in the work has been established among both the gas suppliers and the appliance makers. The imprimatur of the laboratory is something which the makers desire, and do not despise; it is something which gives to suppliers complete assurance that an appliance can be safely recommended and installed.

The completeness and thoroughness with which the testing is done, and will continue to be done, by qualified men are the fundamentals to the confidence that has been created. This is a big step forward. The testing centre is at Cleveland; and one of the advantages of its location is that there is available every type of heating gas from producer to carburetted water gas (varying in calorific value from 300 to 600 B.Th.U.), and coke-oven and natural gas. That things are not being done on a small scale is seen from the fact that the laboratory has a 150,000 c.ft. holder; a 800,000 c.ft. holder will store one of the base gases, as soon as the research work on mixed gases is under way. In a 5000 c.ft. holder, the various gases can be mixed; while small holders are also in use from which one kind of gas can be used, or a mixture of two or three in any proportions. The provision for both chemical and physical testing is complete. As an illustration of the comprehensive character of the examination of appliances, we read that a gas-range, equipped with a thermostat, undergoes about 160 distinct tests. So far, 4638 ranges, 96 space heaters, and 15 different kinds of flexible tubing have been subjected to critical exploration, and have been approved. Prior to October, it is hoped to supply a list of approved water-heaters and house-heating appliances.

The work actually accomplished, with all its detail and scrupulous care, is substantial; and this shows meritorious enthusiasm and recognition of responsibility on the part of the staff. We can foresee that from this mass of work there will issue something more than the approval or rejection of appliances submitted for testing. From it must come information which will serve as a guide to further progress in efficiency and utility, which will be of general advantage. In an article by Mr. R. M. Conner, the Laboratory Director, he says it is difficult to assess the valuable contributions the laboratory has made, and will make, to the industry's advantage. We agree. No exact money value can be placed on such work; but no man with the intelligence which enables him to observe and to penetrate can fail to see that the supersession of the thermal and working inefficient by the thermal and working efficient will bring in its train benefits of untold value. In all countries, the former has already done incalculable injury to the gas industry; that injury can only be effaced, and in time be forgotten, by approved gas appliances being established, which, through the reputation they will create, will be sought for. That the work done at the laboratory has satisfied the men of the American gas industry, and has ratified the belief that it is a movement in the right direction, is attested by the pledges made on behalf of both gas suppliers and the manufacturers of appliances. At the Atlantic City Convention of the American Gas Association, a resolution was passed pledging all member gas companies to confine sales exclusively to approved types of gas ranges; and since then the manufacturers have pledged themselves to make and stock only appliances which have gained the laboratory "hall mark." This dual agreement is a distinct gain; and it will have a marked effect in the future. Moreover, there is nothing in the agreement which will stay progress in invention; for any new design of apparatus, or an improvement in any individual part, can be submitted to the laboratory; and its approval will be a selling commendation.

Mr. Conner says that the biggest job in making the laboratory really effective is to get the American people to realize that its work is of real importance to them. It is a good thing to be in the position to say to a member of the public that these goods have received the approval of the official Testing Laboratory; and there is a tendency for the public to like to be possessed of goods with a stamp upon them guaranteeing their worthiness. The appliances that are approved are stamped with the "Blue Star" seal of the laboratory. It is the symbol of merit. The seal is what the public must be trained to look for, and to insist upon having on their gas appliances. But how is the laboratory to prevent fraud in this matter, by, for instance, the seal being copied by unscrupulous persons, whose goods are not entitled to it?

Another development is that up to the present eighteen demonstration houses have been installed—"Blue Star" homes—adequately piped, and containing equipment of the highest quality available. For general educational work, the Publicity and Advertising Section of the Association have prepared advertising material, featuring the "Blue Star" seal of approval, and the desirability of using only approved appliances. Publicity consists of newspaper advertisements, window display material, mailing cards, with a list of appliances which have passed the standards of the laboratory, and so have its approval. The work of the laboratory is intended to have a tripartite benefit—benefit to the public, the gas suppliers, and the makers of the appliances; and the lines taken, it appears

to us, are the ones to ensure the proper distribution of the benefit.

The "Blue Star" will in America become well known as the symbol of merit for gas appliances. It appeals to us as an excellent idea. The only two points we should like information upon are: (1) Whether any steps have been, or can be, taken to prevent fraudulent use of the "Blue Star" for appliances that have not been subjected to the laboratory's tests; and (2) whether there is any danger of the "Blue Star" damaging business in different grades of the same appliances.

Local Authorities and Workers' Freedom.

THERE are some local authorities who have, by the abuse of individual liberty, been playing pretty freely into the hands of trade unions. It has become a practice with them to make it a condition of the employment of wage earners that they shall be members of such unions; and, in entering into contracts, they require that those with whom they are doing business shall only employ trade union labour. Such conditions have the effect of compelling all employees of the local authorities and contractors to become members of trade unions, whether or not they are in sympathy with the present socialistic and communistic developments within those bodies. It is known that many workers are strongly antagonistic to the extreme policy of the unions; and yet, in order to obtain the wherewithal to maintain themselves and their families, they are compelled to yield to compulsory membership through the action of local authorities. The Trade Disputes Bill intends to alter this; but the trade unions, whose representatives talk so glibly about the unfettered freedom of the unions, are less mindful of the freedom of the individual, and are strongly opposed to having the repression of the will of the worker removed, by making it illegal for local authorities to continue to impose the condition as to union membership. On Tuesday of last week, the House of Commons were considering clause 6 of the Bill, which provides that it shall not be lawful for any authorities to make it a condition of employment of any person that he shall, or shall not, be a member of a trade union, or to impose disability or disadvantage on him as compared with other employees. When the Bill becomes an Act, under this section (which the Labour Party made a strong attempt to destroy) any municipal worker who is dismissed in contravention of the new law will be in a position to commence an action for damages for wrongful dismissal. To the clause an addition has been made, which will cause it to be unlawful for public authorities to make it a condition of any contract or tender that any person employed by any party to the contract shall, or shall not, be a member of a trade union. Manufacturers and contractors generally will be glad to have the restriction upon labour finally cancelled. Another useful proviso finds place in the measure. It is: "If any person employed by a local or other public authority wilfully breaks a contract of service with that authority, knowing or having reasonable cause to believe that the probable consequence of his so doing, either alone or in combination with others, will be to hinder or prevent the discharging of the functions of the authority, he shall be liable, on summary conviction, to a fine not exceeding £10 or to imprisonment for a term not exceeding three months." This is an extension of the operation of the Conspiracy and Protection of Property Act, 1875, which, as far as gas and water employees are concerned, has operated for 52 years, and as far as electricity employees are concerned, for the last 8 years. The passing of the proviso will thus bring all other public services within the ambit of the useful section of the 1875 Act.

Situation in the Coalfields.

THE position in the coalfields is giving cause for anxiety; but it is hoped it is only a passing phase, due to the abnormal conditions inflicted by the circumstances of last year. Coal exports have again fallen; the demand for coal for home use has dropped to summer level. Stocks have been accumulating; and the situation in other countries in this respect is much the same as here. In consequence, there is short-time working at several collieries. Indeed, some pits have ceased production; others are bordering on the same condition. The effect of ascertainments is to bring wages in almost every coalfield down to the minimum guarantee of the 1926 agreements. This is the case in South Wales, Yorkshire, Durham, and Scotland, and other areas are nearing the same state. Small wonder the Executive of the Miners' Federation are anxious. There is another cause for anxiety on their part; and it is the fact that less than half the miners are now organized. The condition of the coal business, and the withdrawal of men from the unions, are effects of the protracted stoppage of last year. The winter business for British coal was totally killed by it; and the Miners' Federation are alone responsible (although they will not admit it) for the destruction of employment in the home industry. Mr. Cook—or "Creepy Cook" as he has been called in one quarter—predicts a "still graver crisis ahead." He also declares that the present conditions are "more than flesh and blood can stand." He wants to make the country shiver, as also to bring himself into the limelight again. Mr. Cook and his like on the Executive of the Miners' Federation (which is not now representative of the men) know perfectly well that what has happened is due to the insensate policy they pursued last year, and to nothing else. Even the present state of things on the Continent is only part of the aftermath of that trouble. The same illogical individual blames the eight-hour day for the current situation. In that there is no truth. Had it not been for the eight-hour day, and through it a reduction of the costs of production, many collieries would have had before this to discontinue winding.

"Stale Investments."

WHAT appears to us to be a comparatively new form of adventure in the gas investing world is well worth watching, and perhaps should be the subject of warning to holders of gas stocks. Stockholders in well-established gas companies have had circulated among them typewritten letters by stock and share dealers, who invite them to part with their gas stock at below market value, and invest in other concerns which, it is suggested, will give them a safe and a higher yield. It should be apparent that, if it is worth while such a firm buying the gas stock at the figure they name, and then, to those from whom they have bought the stock, disposing of other shares said to be paying a 10 p.ct. dividend, it should pay them better to keep the 10 p.ct. shares as an investment for themselves, and not buy the gas stock which receives a lower dividend. That is so obvious that we hope it will alone be a protection to those who possess stock in sound gas undertakings, and will prevent them being so foolish as to fall victims to the dividend allurement referred to. People who issue circular-letters of this kind are not philanthropists. Naturally, they are out to make money, and at somebody's expense. One circular-letter before us, which has been addressed to the stockholders in a long-established gas undertaking, with a high reputation for progress and constant dividend payments, is headed "Your Stale Investment." The senders are careful not to say that the gas stock is a "stale investment;" but some simple souls may think that the firm, being stock and share dealers, know more about these things than they do themselves, and that (the circular-letter being addressed to them as gas shareholders) the gas stock in question is regarded by the firm as a "stale investment." The two things being connected—indirectly if not directly—it is enough to make the hair of some innocent investors stand on end to read: "Like everybody else, you will have among your securities some share on which you can never hope to receive permanent dividends." The question is then put: "Why not make up your minds to dispose of them, and re-invest the proceeds again in three world-renowned shares paying regular dividends." And then comes the seductive point: "We have before us three shares in old-established concerns whose record is unimpeachable, which give an average yield of nearly 10 p.ct. We can affirm that these three shares will stand the test of any fair inquiry. If you are interested, please write to us." There follows more which invites the consideration of those suffering from cupidity or from shortness of common sense or resisting power. The 10 p.ct. bait is dangled freely before

them. The circular winds up by offering two points below par for stock in a fine gas undertaking, which has been registering local dealings in its stock at £103 and £104, and is paying a 6 p.ct. dividend. No doubt the firm of share and stock dealers know as much regarding the intrinsic value of these shares as we do. Hence their benevolent interest in them. Hence, too, their willingness to buy any quantity up to "£500" at the price they name, free of all expense. We do not for one moment suppose they would stop at £500. The more they can get, the better for them; otherwise they would not be seeking this business, and trying to effect what is tantamount to an exchange of shares. These dealers know perfectly well they themselves are safe in making such a bargain.

One of the Birthday Honours.

There will be hearty congratulations from a large circle of friends in the gas industry to Mr. Reginald James Neville Neville, J.P., M.P., upon the honour of the baronetcy which the King has been pleased to confer upon him. The new baronet is almost as much a gas man as he is a barrister. We should have to dip far into the past to find the year when he first became a Director of the now defunct Brentford Gas Company, of which he was Chairman for many years prior to its amalgamation with the Gas Light and Coke Company. His intimate knowledge of the Brentford Company and of its affairs—technical, commercial, and financial—was developed by the same skill in mastering details as was displayed in his legal work when (before becoming a member of the House of Commons) he practised at the Parliamentary Bar. We remember many important fights in connection with legislative developments in the gas industry with which he was identified, and in which his inside knowledge of gas matters served handsomely. Since the absorption of the Brentford Company by the Gas Light and Coke Company, he has been a Director of the latter.

British Motor Spirit.

Since it was found that certain individuals from Russia were violating the privileges of their domicile here, by working subterraneously against our national interests, and therefore have had notice to quit our shores, there has been a certain amount of propaganda with reference to Soviet-derived petrol. In order that readers of the "JOURNAL" may assist in giving denial to any rumours which may be detrimental to the National Benzole Company, Ltd., we wish to emphasize the fact that "National Benzole Mixture" is composed of benzole produced from British coal and petrol refined within the Empire. It is produced and distributed entirely by British labour, and exploited by British enterprise and capital—in short, it is completely British. We are sure that this official announcement will be welcomed by our readers, and that they will assist in countering any statements of a contrary nature.

Another Electrical Campaign.

One of our electrical contemporaries publishes the information that work on another electrical campaign for next autumn and winter has begun. It believes that, on this occasion, it will be purely an electrical campaign organized by the Electrical Development Association, though the "exact lines on which it is being planned are being kept secret at the present time." With reference to the "Wiring of British Homes Campaign," and the competition held in connection with it, which ended last March, it is announced that the winner of the first prize—an all-electric house, or a cheque for £2000—is a Miss Gardiner, of Bristol.

Gas Oil Prices.

In our "Correspondence" and "Editorial" columns last week, reference was made to the dissatisfaction in the gas industry regarding the price which the vendors of gas oil are still asking, which price is unjustified, and is the main cause of gas undertakings reducing their use of carburetted water gas, or in its manufacture diminishing the consumption of oil per 1000 c.ft. Regarding the question of justification, we learn from the "Petroleum Times" that the production of crude oil in the United States is steadily increasing, the seriousness of which, from our contemporary's point of view, is shown by the official output figures for the first three months of this year. During that period, America produced 214,653,000 barrels of crude oil, which is approximately 40,000,000 barrels more than in the corresponding quarter of 1926. Of the total production of the United States for the three months, 185,609,000 barrels was light crude oil. In other quarters, it is stated that the United States Government are keeping a close watch upon the trend of production, home consumption, and exports.

Unification in Street Work.

The old question has been raised in the House of Commons as to whether there cannot be unification between authorities controlling gas, electricity, water, and any other services which involve the laying of pipes and cables, with the view to reducing to a minimum the public inconvenience caused by the breaking-up of roadways. The question was put to the Minister of Transport by Sir H. R. Thomas. Colonel Wilfrid Ashley could only reply that the various undertakings voluntarily supply his Department with a considerable amount of information as to street works of importance which they contemplate carrying out; and every effort is made to co-ordinate their operations with other street works as far as is reasonably practicable. As an instance of co-ordination, he mentioned that Piccadilly is to be repaved in the near future; and it has been arranged that the work shall be executed in August and September, when the Water Board, the Gas and Electricity Companies, and the Post Office will look after any necessary work. If those who ask these questions knew of the many factors which occasion road openings, and which vary with each public utility, they would know that it is altogether impracticable to attempt to co-ordinate them precisely, though at the same time much can be done, and is done, in the manner mentioned by Colonel Ashley, in the interests of economy and public convenience.

Coal Output.

During the week ended May 14, the production of coal amounted to 5,159,700 tons; the number of workers employed being 1,031,500. The production in the week ended May 21 was 5,052,200 tons; the number of workers being 1,026,700.

Employment.

At the beginning of last week the Ministry of Labour were able to issue the best return regarding employment which has been made for seven years. It shows that the number of persons registered as workless on May 23 was 978,200—the lowest total since 1920, from which year the period of trade depression dates. This is the fourth occasion since 1920 that the unemployment total has fallen below the million mark. The worst point in trade depression was in June, 1921, when 2,500,000 were registered as out of work. Considering the trade disputes of last year, the present position is not unsatisfactory. It might be mentioned that, on the eve of the general strike last year, the unemployment figures were below a million.

National Playing Fields Appeal.—The National Playing Fields Association, of which the Duke of Sutherland (the new President of the Society of British Gas Industries) is Senior Vice-President), are asking for £1,000,000, for the purpose of providing with green playing fields the thousands of boys and girls whose only playgrounds are the streets and slums of our cities and towns. In London each year about 1400 clubs apply for pitches, of which only 200 are available. Consequently a vast number of lads have to join the great army of "loiterson," or turn to other less desirable ways of spending their leisure hours. Cheques and money orders should be crossed and made payable to the National Playing Fields Appeal, and sent to the Midland Bank, 5, Threadneedle Street, London, or to any branch of the Midland Bank. Subscriptions in Scotland should be sent to the Clydesdale Bank or the North of Scotland Bank. All money subscribed in Scotland will be spent in Scotland.

PERSONAL.

After nearly nineteen years' service, Mr. J. W. MACKAY is retiring from the position of Deputy Engineer to the Shanghai Gas Company, Ltd.

Sir RICHARD TETLEY GLAZEBROOK, K.C.B., F.R.S., has been appointed, by Order of Council dated May 26, to be a member of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

Willersley Castle, Matlock, which was built at the end of the eighteenth century by Sir Richard Arkwright, whose invention revolutionized the cotton industry, has been purchased by Sir ALBERT BALL, who is known to "JOURNAL" readers as the Chairman of the Nottingham Corporation Gas Committee.

The Bradford Corporation Gas Committee have appointed Mr. EDWARD CROWTHER, of Stoke-on-Trent, Deputy Gas Engineer in succession to Mr. E. J. Sutcliffe, the newly appointed Engineer and General Manager. Mr. Crowther is expected to take-up duty on July 18. He was appointed out of fifty-four candidates, which number was subsequently reduced to two.

Mr. JOHN SMITH, Chief Clerk to the Glasgow Corporation Gas Department, was last week made the recipient of a wallet of Treasury notes, on the occasion of his retirement after having served the Gas Committee for 46 years. Mr. J. W. M'Lusky (General Manager and Engineer), in making the presentation, paid Mr. Smith a high tribute for his ability. An appreciation of Mr. Smith's services has been recorded in the minutes of the Gas Committee.

Six selected candidates for the position of Engineer to the Devonport gas undertaking, the salary attached to which is £750 per annum, rising by yearly increments of £50 to £850, were interviewed by the Plymouth Corporation Gas Committee at a special meeting on Tuesday, May 21. It was resolved to recommend the Council to appoint Mr. JOHN T. HAYNES, aged 35, Assistant Gas Engineer at Bolton, who has had previous experience at Liverpool and Lancaster. Mr. Haynes is an Associate Member of the Institution of Civil Engineers and a Past-President of the Manchester and District Junior Gas Association. The Committee also recommended the appointment as Chief Assistant Engineer, at a salary of £375 per annum, rising by yearly increments of £25 to £450, of Mr. FRANK BLACKBURN, aged 31, Assistant Superintendent of the City of Leeds Gas Department. Mr. Blackburn is an Associate Member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers, and holds the diploma of the University of Leeds in mechanical engineering.

The official list of honours conferred by the King on the occasion of his 62nd birthday contains the announcement that Mr. R. J. NEVILLE NEVILLE, J.P., Member of Parliament for East Norfolk, and Recorder of Bury St. Edmunds, has been created a Baronet, as has also Sir HARRY B. RENWICK, K.B.E. —the latter for political and public services in connection with electricity schemes. Mr. Neville was Chairman of the late Brentford Gas Company, and is now a Director of the Gas Light and Coke Company. Alderman JAMES CROOKS, J.P., for many years Chairman of the St. Helens Corporation Gas Committee, receives a Knighthood. As a recognition of his eminent services in scientific research and its application to industry, Sir CHARLES A. PARSONS, D.Sc., F.R.S., the inventor of the turbine, is appointed to the Order of Merit. The Order of G.B.E. (Civil Division) has been conferred upon Sir HENRY F. HEATH, late Secretary to the Department of Scientific and Industrial Research, and Sir RICHARD THRELFALL, F.R.S., who is a member of the Advisory Council for Scientific and Industrial Research.

OBITUARY.

At the recent meeting of the Bideford Gas and Coke Company, Ltd., the Directors reported with regret the death of the Chairman, Mr. F. A. SEARLE, who had been associated with the Board for a period of twenty years. For three-quarters of this time he had occupied the chair.

ELECTRICITY SUPPLY MEMORANDA.

INFORMATION from the United States informs us that from 1919 to 1925 the electricity supply companies have increased their fuel utilization efficiency by 52 p.ct. This does not mean the thermal efficiency, but the increase of the average number of KW.-H. generated per ton of coal. The enhanced cost of coal has been the spur that has brought this about, and the accomplishment is due to the improvement in design and increase in the size of plants, interconnection, and higher loads. The best coal-burning plants, it is averred, have produced a KW.H. with "about" 1 lb. of coal; and the average is about 2·1 lbs. The "about" before 1 lb. is useful, though indeterminate, because 1 lb. of coal which will produce 1 KW.H. must itself be extraordinarily rich in heat units. It is also stated that gas and oil burning plants have been built, which produce a KW.H. with about 13 c.ft. of gas, and from 425 to 450 KW.H. per barrel of oil.

Fuel Consumption in the States

The summarized fuel consumption returns for 584 stations in this country in 1925-26 have been issued by the Electricity Commissioners. It is highly essential that great care should be taken as to the use that is made of the data. The consumption of coal per KW.H. generated, standing alone, would be highly misleading, seeing that the coal used for the purpose varies so considerably in quality and condition. Some engineers find it more profitable to use the cheap varieties of coal, depending on various factors—such as distance of transport, margin of boiler-house plant, and so forth; while other engineers prefer to pay extra for the better qualities—thus producing more steam per ton, and economizing in transport, labour, and plant. The thermal efficiency is a fairer basis of comparison than the weight of coal consumed per KW.H. The Barton Power Station of the Manchester Corporation is given the place of honour for lowness of fuel consumption. It was 1·36 lbs. per KW.H. generated; and the thermal efficiency was 21·51 p.ct., with a load factor of 41 p.ct. The North Tees station of the North-East Coast Companies came next with 1·51 lbs.; but in this case the thermal efficiency was only 18·75 p.ct., notwithstanding that the load factor was 47·1 p.ct. The Carville station, with a consumption of 1·69 lbs. per unit, had an efficiency of 18·95 p.ct.—the load factor being 52·9 p.ct. The Lancashire Electric Power Company's Radcliffe station consumed 1·67 lbs. of coal per unit; the efficiency being 17·45 p.ct. These figures show how necessary it is to have other data besides the weight of coal used per unit. There are various other big power stations at which the consumption was between 1·81 and 1·98 lbs. per KW.H. There are others which go higher.

And at Home.

Taking the whole of the steam-driven stations, the aggregate output was 7804 million KW.H. from 8,440,000 tons of coal—the average consumption being 2·4 lbs. per KW.H., which means only about 31·8 therms per ton of coal, as compared with 70 to 80 odd therms in the form of gas, and about 140 therms in coke, to say nothing of the tar, sulphate of ammonia, &c. Regarding oil-driven stations, the Bognor Gas Company and the Felixstowe station of the East Anglian Electric Supply Company were lowest with 0·64 lb. per KW.H.; the thermal efficiency being 27½ p.ct. The average consumption of 101 oil-driven stations was 1·05 lbs. per KW.H. The Guernsey gas-power station did not do badly with a consumption of 1·61 lbs. of coal, and a thermal efficiency of 17·23 p.ct. The average consumption of 57 gas-producer stations was 2·6 lbs. of coal. Speaking of low grade fuel, we notice that the Stoke-on-Trent Corporation have entered into a year's contract for slack at 11s. 6d. and 12s. 6d. per ton—mostly at the latter price.

The "Unlets" Now Let.

The writer of "Current Topics" in the "Electrician" appears to have somewhat singular notions. On May 27 he tells his readers that "zealous searchers for truth have been confounded by the peculiar tactics of the gas industry, which, having announced with a flourish of trumpets that the Liverpool Corporation had 100 unlet all-electric houses, now maintains a placid and unholy silence." We think that the "unholy silence" is to be found on the side of our electrical contemporaries. On May 4, we noticed that the Liverpool papers had reported the fact that 100 (or rather 150) all-electric houses were unlet. About such plain and truthful statement of fact there was nothing which could be faithfully described as "peculiar tactics" or "a flourish of trumpets." Our contemporary, so far as we have observed, did not think fit to mention the matter until May 20, and then it was to talk about "the smile on the face of the tiger," the "tribulation of the gas industry," and something about "sober reflection" and "analysis." We have not heard of any "zealous searchers for the truth" being in any way "confounded" by the plain statement of fact. If they have been, they must be mentally unbalanced. Until our contemporary told us, we were also unaware that there had been any "placid or unholy silence" on our part. However, the "Electrician" is to be complimented on its ability to add to the amusement of the gas industry. It is now our gratifying duty to congratulate the Housing Committee of the Liverpool Corporation on having let the whole of the previously unlet all-electric houses—at any rate, the "Electrician" has it, "on the authority of the Liverpool Corporation Director of Housing, that the Corporation have not at the present time a single vacant or unlet all-electric

house "—the Housing Committee having allocated all the available property. The whole point of the business is that the Committee were unable to let the all-electric houses under the conditions which it was thought they could command, and have had to relax them greatly before tenanting the empty dwellings. No doubt the Committee could have let the houses earlier had they had more modest views as to the conditions which could be applied to the tenancy of all-electric houses. There will be more moderation in the future—a broader field than the one first plotted out being required from which to glean tenants for houses in which electrical units having a potential heating value of 3412 B.Th.U. are to be used, while other heating agents give a far higher value for money expended by the householder. But as to our "placid and unholy silence"! We have no doubt that "Meteor" of the "Electrical Times" is laughing with us.

Heating Business. Mr. F. W. Leevers is of opinion that there is need for a little "original thinking" in the electricity industry. He says this in an article in "The Electrician," in which he has put his shoulder up against the industry, and has given it a push in the direction in which he thinks it should go. He is of opinion that it should "come off the old perch" from which it has been conducting its business developments, and in the merchandizing of electricity follow more the lines of our big stores. What has to be done, according to him, is that the industry must realize at the outset that they are in competition with other means of providing light, heat, and power, and that, to secure the big business, they must offer something better than the competitors, and, moreover, this must be done in such a manner that the public will appreciate that what is offered is in reality better. It is not light and power for which a bold bid must be made. In Mr. Leevers' view those lines of business are pretty safe, and so to-day are of secondary importance compared with what would result from the extensive use of electricity for heating purposes. That is the "big business." The total amount of heating energy (in various forms) consumed in this country is enormous compared with energy for lighting and power; but it is agreed by Mr. Leevers that electricity is not an economical medium for all heating requirements. In that we are with him, because it is so easily proved that it is not economical for most heating purposes. Electricity only provides, on an average, from every ton of coal used by it 31·8 therms, while, as pointed out in an earlier paragraph, the gas industry obtains from each ton of coal it uses from 70 to 80 (or more) therms in the form of gas, and 140 therms in coke, to say nothing of the other secondary products. Mr. Leevers is wise in saying that there is no necessity whatever to advocate electricity for those applications for which it is not economical or suitable. That admission at once cuts away the major part of the purposes for which heat energy is required in this country. But Mr. Leevers' views in this connection are not ours. He states that "electricity can be generated at rates that permit of an all-in cost which will compare favourably with other forms of energy when used for most domestic and industrial purposes. But, notwithstanding, there is a lingering impression in the minds of the public that electricity is expensive." The advice of Mr. Leevers is that there must be concentration on the work of extinguishing this bogey, and all interests should combine in a campaign to drive home at every opportunity the truism that "Electricity is Cheap." It is no good trying to elevate the postulation that "electricity is cheap" into a "truism" if it is not true, because the electricity industry will soon be found out by the consumers, as it is being found out in connection with heating and cooking. He suggests that the work to be done must also include the creation in the minds of the public of an impression of the additional value electricity affords, on account of the advantages it has over and above its competitors. He does not, however, state what are those superior advantages, and in this perhaps he is wise. We know of no advantages which electricity can offer for heating which can annihilate the greater economy, the labour-saving, and the other excellent attributes of gas service.

Boys will be Boys. When high voltage overhead transmission of electricity becomes general in rural areas, something will have to be done effectively to prevent boys climbing the poles supporting the cables. There have been occasional deaths through this; and another is reported from Bargoed. William Yates (age 9) was the victim. He climbed a steel-lattice standard which carries the electric cables from the Bargoed power station over the mountain to Taff Merthyr. To do this, he had to get over several strands of barbed wire, which are placed some distance from the ground as a protection. His companions state that they saw a flash when Yates got up to the cables. He was killed instantaneously. The voltage was 11,000.

Bi-Part Tariff. It is stated that the two-part tariff for electricity supply has been adopted in about seventy towns. Birmingham is the latest recruit to the ranks, or will be if the City Council endorse a recommendation of the Electricity Committee. The object, of course, is to develop the use of current in domestic dwellings for purposes other than lighting. The basis on which the fixed quarterly charge will be made has not yet been determined; but it is suggested that the secondary charge shall be ¾d. per unit for all purposes, and that it shall come into operation in September. The present charge is 4½d. per unit for lighting, and 1½d. for other purposes. Consumers will have the option of remaining on the flat-rate system, or transferring to the new one.

Bigger Distributing Cables. We are told by "Meteor" of the "Electrical Times" that the Electricity Commissioners are taking a greater interest in domestic electricity uses and local distribution. With them it is a sort of side issue from looking after generation and transmission. Some time ago, it will be remembered, they appointed a Special Committee to report upon tariffs, and the development of the domestic business. Their report was dated July 17, 1926. Nothing particularly novel appeared in it, except that the Committee apparently thought (as mentioned in an editorial a few weeks ago) that electricity cables should receive preferential rating treatment—preferential compared with gas and water mains. "Meteor" reminds his readers that the Commissioners are empowered to prescribe regulations for ensuring a proper and sufficient supply of electricity by authorized undertakings. They have lately issued a memorandum to the Incorporated Municipal Electrical Association and the Provincial Electric Supply Committee, in which they say:

> In view of the increasing demand for electricity for domestic purposes, and of the developments which may reasonably be expected during the next few years, the Commissioners desire to urge that authorized undertakers in general should adopt the policy of anticipating such demands by the provision of distributors of adequate section. They suggest that, except in special cases, distributors having a cross-section of not less than 0·05 sq. in. should as a general rule be provided.

"Meteor" is of opinion that 0·05 sq. in. cable should no longer be used, save in exceptional circumstances. He would take a much bolder step in providing for the electrical requirements of the future. "Meteor" must have at command a lot of money with which to speculate, and apparently he thinks other people have the same. He is optimistic and venturesome. So was Don Quixote.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 11.—North of England Gas Managers' Association (Auxiliary Section).—Fifteenth half-yearly meeting in Newcastle at 2 o'clock.

June 11.—London and Southern District Junior Gas Association.—Visit to the Margate Works of the Isle of Thanet Gas Light and Coke Company.

June 14.—Illuminating Engineering Society.—Meeting in the Stationers' Hall, E.C. 4, at 6 o'clock. Discussion on "The Relation between Illumination and Fine Work, with special reference to the Lighting of Printing Works."

June 15.—Association of Statutory Inspectors of Gas Meters.—Eighth annual general meeting in the New County Hall, Westminster Bridge, S.E. 1, at 10.30. Paper by Mr. E. C. Holt, of the Gas Light and Coke Company, entitled "Recent Improvements in Gas Meters."

July 12.—National Gas Council.—Annual meeting at the Hotel Cecil, at 3.15.

Sept. 23.—Southern Association of Gas Engineers and Managers.—Visit to the Torquay Works of the Torquay and Paignton Gas Company.

Institution of Gas Engineers.

June 13.—Council meeting.
June 14-17.—Annual General Meeting in London.
July 11.—Emergency Committee.
Finance Committee.
July 12.—Gas Education Committee.

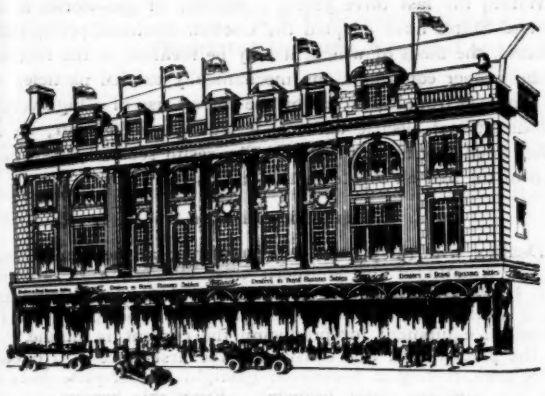
Institution of Heating and Ventilating Engineers.—The summer meeting of the Institution will be held at Bournemouth on June 20, 21, and 22.

National Gas Council.—The ninth annual report and statement of accounts will be presented by the President (Sir David Milne-Watson, LL.D., D.L.) at the meeting to be held at the Hotel Cecil, Strand, W.C., at 3.15 on Tuesday, July 12.

Flat Gas Pipes over a Subway.—In Cincinnati there is an important thoroughfare with a subway beneath it, where the scant space between the subway top and the paving level has made the problem of transporting a sufficient gas supply a difficult one. The solution of the problem has been found in the employment of rectangular riveted steel pipes, having a centred I-beam inside to resist the weight of the traffic.

ADVERTISING GAS IN THE BIG STORES.

Newcastle and Gateshead Gas Company Prove Its Value.



The Premises of Messrs. Fenwick, Ltd., Newcastle.

Last month the Newcastle-on-Tyne and Gateshead Gas Company had further proof of the remarkable value of co-operative advertising. In conjunction with Messrs. Fenwick, Ltd., of Newcastle—who also have an establishment in Bond Street, London—they arranged a series of gas cookery demonstrations and displays at this firm's large stores. The Company find that such demonstrations are more effective than if held in their own premises or in separate halls, for many people who would have no cause to visit the gas showrooms have their interest aroused by the displays in the stores which they visit, and become enthusiastic members of gas-cookery demonstration audiences. The demonstrations at Messrs. Fenwick's were given three times daily at 11.30 a.m., 2.45 p.m., and 4 p.m. from May 16 to 21, and were attended by a big gathering of ladies. Miss E. M. Dods and Miss Freda Wood were the demonstrators; and one of our illustrations shows part of the audience at one of the lectures.

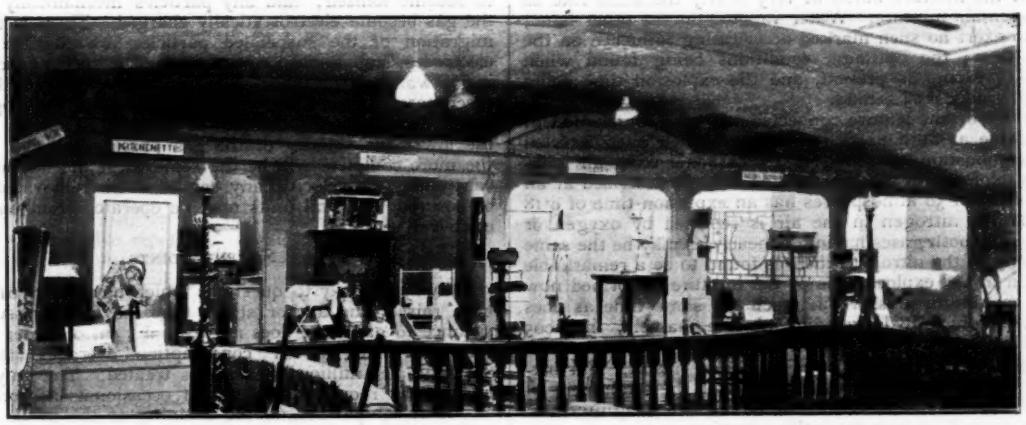
CO-OPERATIVE ADVERTISING.

Naturally the event was well advertised; and as both the Gas Company and Messrs. Fenwick were interested in the results, extra prominence was given to the Press announcements. The firm made extensive use of the Gas Company's slogan "Come and see how gas can add the 'chef touch' to all your cooking;" and this, emanating from a firm of high standing, had its independent appeal. Also, one of the main arcade windows of the stores was allotted to the Company, and in this an ideal kitchen was exhibited.

THE DISPLAYS.

In addition to a comprehensive show of cooking utensils and

A Portion of the Window Display of an Ideal Gas Kitchen at Messrs. Fenwick's.



SUGGESTIONS FOR MODEL ROOMS—KITCHENETTE, NURSERY, SCULLERY, CHILD'S BEDROOM, AND HOME LAUNDRY.

COOKERY DEMONSTRATION AT MESSRS. FENWICK'S.

labour-saving domestic appliances, the main feature was a display consisting of six model rooms, in which gas appliances were exhibited in conjunction with the goods of Messrs. Fenwick. These rooms comprised an ideal bathroom, a nursery, a kiddies' bedroom, a kitchenette, a scullery, and a home laundry. In the last-named, demonstrations of laundry work were given at the end of each cookery lecture.

Over 5000 people attended the lectures and viewed the displays.

COMBUSTION OF CARBONIC OXIDE AT HIGH PRESSURES.

On Friday, June 3, Prof. W. A. Bone, F.R.S., gave the fifth of a series of eight lectures on "High-Pressure Gas Research" at the Imperial College of Science and Technology. The lecture was devoted to a description of the apparatus and experimental methods used in the study of gaseous explosions at high pressures, and to an account of some of the results obtained when certain simple gas mixtures are exploded in a closed vessel. The work referred to was carried out at an initial pressure of 50 atmospheres in a spherical steel bomb of ¼ litre capacity, fitted with a gauge for recording the changes of pressure both during and after the explosion.

It is well known that at ordinary pressures carbonic oxide burns in air more slowly and with a more highly radiating flame than does hydrogen, and that the presence of a trace of hydrogen, water vapour, or other hydrogen-containing substance greatly facilitates, though it is not essential to, the combustion. Thus it has been found that at ordinary pressures 6 p.ct. of water vapour, or alternatively 3 p.ct. of hydrogen, is necessary to give the maximum speed for a carbonic oxide flame burning under certain specified conditions.

With regard to experiments at high pressures, the results obtained differ in some important respects from those at low pressures. When, for example, carbonic oxide-air and hydrogen-air mixtures, both containing sufficient air for complete combustion, are fired in a closed vessel at an initial pressure of 50 atmospheres, the former burns relatively slowly, the explosion time being about thirty times as long as for the corresponding hydrogen-air mixture. If now a small part of the carbonic oxide in the aforesaid mixture is replaced by its equivalent of hydrogen, the explosion time is considerably accelerated; and an examination of the pressure-time record shows that the mixture burns at very nearly the same rate as the hydrogen-air mixture. Water vapour, on the other hand, is found to exert no such marked accelerating influence on the explosion time; the optimum conditions being found when 0·05 p.ct. of vapour is present, and the explosion time being shortened by only 0·03 second.

Another important feature connected with the combustion of carbonic oxide at high pressures is the marked effect exerted upon its combustion by nitrogen. A carbonic oxide-air mixture when exploded in a bomb such as the one described at an initial pressure of 50 atmospheres has an explosion time of 0·18 second. If the nitrogen in the air is replaced by oxygen or carbonic oxide (both gases having as nearly as may be the same heat capacity as the nitrogen) there is found to be a remarkable acceleration in the explosion time; the mixture so formed now attaining maximum pressure in much the same time as does the corresponding hydrogen-air mixture—namely, in 0·005 second. Replacement of the nitrogen by the inert, monatomic, gases argon or helium produces a similar result. Furthermore, the rate at which energy is lost after the attainment of maximum pressure is also accelerated. The magnitude of these changes will be seen from the following:

Mixture.	Initial Pressure.	Explosion Time.	P.Ct. Fall in Pressure in 0·05 Sec. after Max. Pressure.
	Atms.	Sec.	
$2CO + O_2 + 4N_2$ . .	50	0·190	11 6
$2CO + O_2 + 4O_2$ . .	50	0·005	33·3
$2CO + O_2 + 4CO$.	50	0·010	34·3
$2CO + O_2 + 4A$ . .	50	0·025	26·4

It will thus be seen that the effect of the presence of nitrogen upon the combustion of carbonic oxide under these conditions is (*a*) to produce a marked "lag" in the rate at which pressure is developed, and (*b*) to retard the rate at which the hot products of combustion cool down.

These facts, together with others derived from a spectroscopic study of such explosions, have led to the conclusion that nitrogen plays a definite part in the combustion. There are very strong reasons for supposing that it is able to absorb the radiation emitted by carbonic oxide burning at high pressures, thereby becoming "activated." When in this condition it is able to unite directly with oxygen to give nitric oxide; and yields of nitric oxide have been obtained from high-pressure explosion experiments far in excess of those predicted from any thermal considerations.

COTTRELL ELECTRICAL PRECIPITATION PROCESS.

Within the last three years, a number of gas-works in the United States have adopted the Cottrell electrical precipitation process, the basis of which, it may be recalled, is the fact that under proper conditions any mechanically carried particles can be removed from air or gas by the correct use of a high-voltage uni-directional electric current—a true gas or vapour, on the other hand, not being affected. The result secured is a separation of tar and oil fog from the gas itself.

The Precipitator.

Dealing with the process in a paper read at the annual meeting in Atlanta of the Southern Gas Association of America, Mr. H. M. Pier, of Chicago, stated that the apparatus making-up a Cottrell installation is composed of two elements. The electrical equipment for producing the current is simple. As to the precipitator, this consists in the first place of a circular steel tank having a horizontal gastight header-plate between the gas inlet and outlet branches. From this header-plate are suspended vertically a number of 6 in. tubes 9 ft. long. The tubes are open at the ends, and serve as the collecting surfaces. Down the centre of each tube is suspended a rod or wire, with a weight at the bottom to hold it taut. Thus the distance between the tube and the rod is practically 3 in. at all points. The rods are carried on a structural steel framework in the upper header; and this framework in turn is carried on porcelain insulators which are placed in compartments at the sides of the main precipitator tank near the top. Thus the rods, to which the current is applied, are electrically insulated from the shell and the collecting electrode tubes. The gas enters the precipitator on one side near the top, flows down around the outside of the tubes, and then passes upwards through the tubes. The purpose of the downward passage is to secure good distribution of the gas between all the tubes. It is during the upward travel through the tubes that the precipitation is accomplished. The gas leaves the tubes freed of tar and oil, and passes to the outlet.

As the gas passes up through the tubes, it is subjected to the strong electrical field set-up by the corona or silent discharge carried on the rods. Passing through this field causes the gas to become ionized; and any particles mechanically carried in the gas become electrostatically charged. There is therefore a migration of the suspended particles towards the collecting electrodes, and finally a precipitation of such particles on the inside walls of the tubes. In the case of a liquid like tar, the precipitated material flows down the tubes into the open header below, from which it runs out at any desired point. Of course, the lower the velocity of the gas passing through the tubes, the more complete will be the removal of the tar and oil. By controlling the velocity, any degree of tar removal desired can be secured. Several units may be operated from one common electrical set.

Salient Points.

By way of reply to questions which have from time to time been raised, the author states that the back-pressure, or resistance to gas flow, does not exceed ½ in. of water; and it is constant. The power consumption averages about 5 to 8 kw.-h. per million c.ft. of gas treated. The only attention and labour required are that of occasional inspection of the electrical equipment and the cleaning of the insulators in the precipitator with a cloth at intervals of usually once a month or every six weeks. The process does not cause any physical or chemical change in the tar; and it will precipitate that moisture which is entrained, but not that in vapour form. It will not break-down an emulsion, nor will it cause any emulsion to form. Gases as high as 140° to 150° Fahr. have been treated with good results, although for best operation the temperature should be about the same as that in the purifiers, or, in other words, round about 90° Fahr. If an explosive mixture passes through the precipitator, there will be no explosion unless there is an arc-over at the same instant that the explosive mixture is in the precipitator. Arc-overs occur at infrequent intervals. The normal corona will not ignite an explosive mixture. There is no excuse for an explosive mixture at any time; and the possibility of it reaching the precipitator at all is extremely remote. The chance of an explosive mixture reaching the precipitator at the same time that an arc-over occurs is almost negligible. In something over twenty installations, which have been operating two or three years, and treating an aggregate in excess of 300 million c.ft. of gas per day, there have been no explosions. The process does not strip the gas or reduce its calorific value.

By far the greatest consideration, however, Mr. Pier contends, is the fact that, by the use of this equipment, a really clean gas is secured; and that means to the gas man increased life and better efficiency in the purification system, with resultant lower cost for this stage in the manufacture of gas.

RELATIVE IGNITIBILITIES AND COMBUSTIBILITIES OF DOMESTIC COKES.

TESTS ON THE POSSIBILITIES OF A "BRAZIER AND WEIGHING METHOD."

By T. F. E. RHEAD, M.Sc., F.I.C., and R. E. JEFFERSON, M.Sc., A.I.C.

[Reprinted from the "Journal of the Society of Chemical Industry" for May 6.]

[*The article is referred to in the Editorial columns.*]

While conducting an investigation into the large-scale carbonization of various coals and blends, the desirability arose of being able to determine ignitibilities* and combustibilities† of the resultant cokes—particularly from the standpoint of their suitability for the open domestic fire.

It was considered essential for such determinations that the coke should not be powdered, but should be used in lump form, thereby retaining all the characteristics which influence its burning, and the fire should be allowed to burn under natural draught. It seemed desirable to follow domestic conditions as far as practicable.

After a survey of the published methods on the subject, it was decided to investigate the possibilities of a method based on the continuous weighing of a fire. As the use of the normal type of open grate raised difficulties due to weight and multiplicity of design, recourse was had to various patterns of brazier; and the question of grates left for future consideration. The brazier has several good points, such as being (1) simple in design, (2) easily duplicated, (3) capable of light construction, (4) symmetrical about a vertical axis, and (5) less likely than the more normal grate to mask the real effects of the coke itself on the behaviour of the fire. (The mass of metal and refractory material in the normal grate has a large influence on such behaviour.)

FACTORS AFFECTING THE COKE FIRE.

The numerous factors connected with the burning of a coke fire fall into three groups, and may be summarized as follows:

Group 1.—Factors related to the heap of coke as a whole: (*a*) Dimensions of the heap. (*b*) The size, shape, and packing of the lumps, affecting area of reacting surface, ingress of air,‡ and heat dissipation.

Group 2.—Factors related to the grate: (*a*) Effect on heat dissipation. (*b*) Effect on ingress of air (natural draught).

Group 3.—Factors related to chemical, physical, and structural nature of the coke: (*a*) Moisture. (*b*) Ash (percentage, nature, fusibility, and distribution). (*c*) Volatile matter (percentage, nature, and distribution). (*d*) Structure, including hardness and density. (*e*) Allotropic condition of the carbon molecule. (*f*) Capacity for absorbing, conducting, and radiating heat. (*g*) Variations of factors (*a*—*f*) in different lumps.

PROGRESS OF A COKE FIRE.

In order to produce a fire in a heap of coke lumps a certain minimum aggregation of lumps must be raised (by auxiliary heat) just to such a degree of combustion that the heat imparted to the neighbouring lumps enables these latter to start burning. The successive repetition of this sequence of events causes the zone of combustion to spread through the heap. The rate at which this spreading takes place (for any particular coke) depends on the extent to which the rate of heat production exceeds the rate of heat dissipation. When the latter exceeds the rate of heat production the fire dies out.

It is common experience that the position at which attempts are made to start the fire has a considerable effect on the ease of starting—*i.e.*, ignitibility, and upon the rate at which the zone of combustion spreads through the heap. If started at the exposed sides or top, the conditions are favourable for rapid heat dissipation, and ignitibility, &c., are adversely affected. If centrally at the bottom of the heap of coke to which air has free access, conditions are less favourable to heat dissipation; moreover, the increasing height of burning zone induces more rapid ingress of air, which generally increases the rate of combustion, resulting in the raising of the temperature of the fire. This enhanced temperature further intensifies combustion until a temperature may be reached at which the rate of air ingress ceases to increase.§

As the fire progresses and the burning zone approaches the exposed surfaces of the heap, the rate of heat dissipation steadily overtakes the rate of heat production; consequently the fire starts to decrease, and finally goes out, assuming that no fresh coke is added.

This is due to increasing quantities of carbon monoxide in products, reduction in fuel, effect of external radiation, reduced extraction of heat from products, and accumulation of ash.

EXPERIMENTAL.

Weighing Apparatus.—After a few preliminary tests on a platform scale, which had a capacity of 120 lbs. and turned with approximately half-an-ounce, it was found that the error in weighing was too large, and a more sensitive scale was necessary. Avery's 1000 troy ounce bullion scale, which turns with 7 grains, proved very satisfactory. It was assembled along with other accessories, as shown in fig. 1. A brazier containing the coke was suspended from one arm of the scale, and after igniting the coke, readings were taken at which definite losses were noted. Automatic recording of loss in weight against time has been tried in a few experiments using the devices in fig. 2 (*a*) and (*b*). These records, however, only give the total loss in weight against time, and make calculations of the rate extremely difficult and of doubtful accuracy. Consideration is being given to a device for recording rate of loss against time.

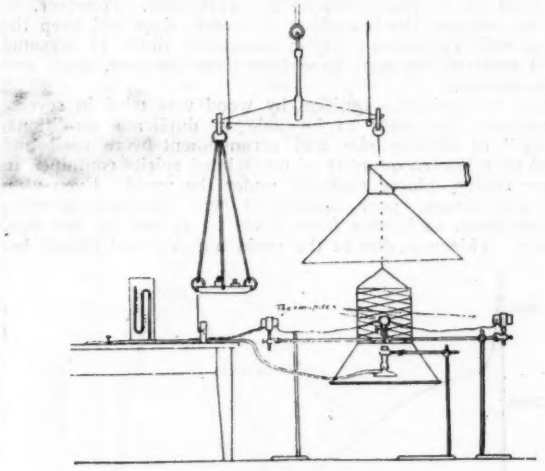


Fig. 1.

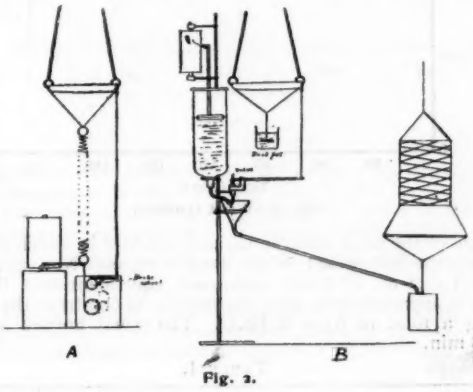


Fig. 2.

Radiant Heat.—The determination of total radiant heat presented serious difficulties, but some idea as to the relative radiations from the different experiments was obtained as follows: Four copper-constantan thermopiles were arranged in series equidistant from each other on a ring with the fire at the centre. The electromotive force was recorded on a recording millivoltmeter. It can be considered as a fair approximation that the ordinates and areas of the radiation curves so obtained give a direct relationship for the intensity and total quantity of heat radiated from the sides of the brazier, bearing in mind that the intensity of heat received will be influenced by the height of the fire in the brazier.

Braziers Used.—The following cylindrical braziers have been used during the tests:

Brazier 2.—Made of heavy, flat, vertical iron bars, with sheet metal bottom, perforated with five ½-in. diameter holes, 10½ in. high and 9½ in. diameter (½ sq. ft. area).

Brazier 3.—Made from light-gauge expanded metal both sides and bottom, 10½ in. high and 9½ in. diameter (½ sq. ft. in area).

* "Ignitibility" implies the ease or difficulty of starting a fire in a heap of coke contained in some form of grate. It obviously depends upon several other factors in addition to the temperature range over which the various constituents start to react with oxygen (Weyman, "Ignition range").

† "Combustibility" implies the rate at which unit weight of coke burns under standardized conditions.

‡ The weight of air passing into the fire is affected by the dimensions of the passages, friction and eddying, change in density, viscosity, composition, and atmospheric conditions.

§ The increased rate of convection currents ceases to compensate for decreased density of air, &c., and consequently the weight of air passing into the fire reaches a limit.

Brazier 4.—Made from light-gauge expanded metal with sheet metal bottom, perforated with five ½-in. holes, 10½ in. high and 9½ in. diameter (½ sq. ft. in area).

Brazier 5.—Same as No. 3, but with ashpan which allowed the air to enter centrally and spread under the entire bottom.

Brazier 6.—Made from light-gauge expanded metal both sides and bottom, but with similar ashpan to No. 5, 11 in. high and 11¾ in. diameter (¾ sq. ft. area).

Weight of Coke used for Each Experiment.—The tests have been carried out by igniting definite weights of graded coke and allowing them to burn to extinction without replenishment or other interference. The method of continually adding fresh coke to maintain the fire has been left for future consideration. It was felt that "burning to extinction" would probably give the most information as to the effect of ash, &c.

The weights of coke used in the tests have varied between 1500 and 6000 grammes—*i.e.*, 3·3 to 13·2 lbs.

For the larger grade of domestic coke (such as that passing through a 2-in. screen and remaining on 1¼-in. screen—*i.e.*, 2 by 1¼ in.—the larger samples are desirable to ensure that they shall be as representative as practicable. However, in order to compare the behaviour of several sizes and keep the time of each experiment within reasonable limits of personal control most of the tests have been done on 3000, 2000, and 1500 grammes.

Means of Ignition.—Ignition by wood was tried in several experiments. In order to be able to duplicate conditions, "sticks" of definite size and arrangement were used and ignited by a known quantity of methylated spirits contained in a paper carton, placed centrally under the wood. Even with these precautions, poor agreement was obtained between duplicate tests, as is seen from Table I., 24 and 25, and figs. 3 and 4. This was due to the rapid burning and erratic behaviour of the wood and the variable manner in which the coke fell into the hollow left by the wood. In tests Nos. 24 and 25, Table I., 12 oz. of wood were used, equivalent to a B.Th.U. input of approximately 5700, together with 600 from the spirits, giving a total of 6300 B.Th.U. The wood burned away in 6 to 8 min.

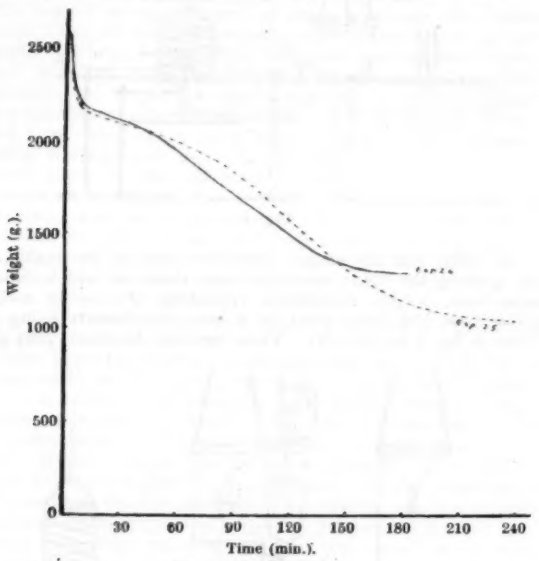


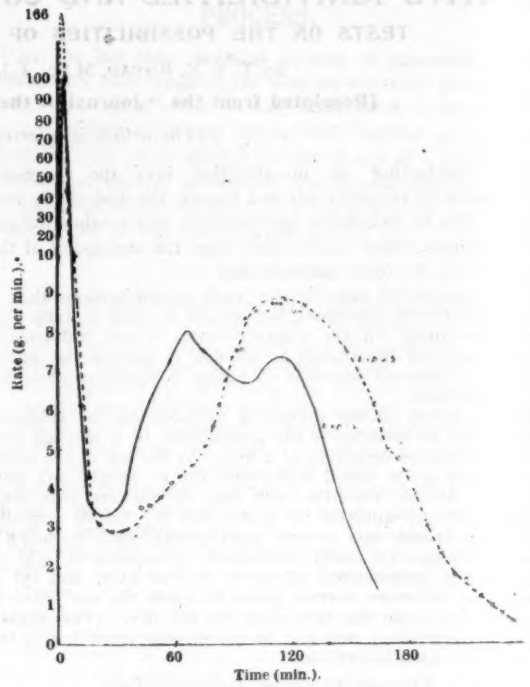
Fig. 3.—Wood Ignition.

TABLE I.

No. of experiment	24	25	41	42
Brazier No.	4	4	4	4
Method of ignition	Wood	Wood	Gas	Gas
Quantity of wood, grammes	350	350	..	..
Quantity of spirits, c.c.	25	25	..	..
Gas used	..	..	6 c.ft. in	20 mins.
Kind of coke (air-dried) (vertical)	A.	A.	B.	B.
Weight of coke, grammes	2200	2200	2200	2200
*Grade of coke	1 by ½ in.	1 by ½ in.	1 by ½ in.	1 by ½ in.
Weight of coke burned, grammes	917	1067	1212	1195
Percentage of coke burned	41·6	48·5	55·1	54·3
Time of extinction, minutes	170	240	250	180
Average rate of burning, grammes per minute	5·38	4·45	4·84	6·63
Maximum rate of burning, grammes per minute	8·3	9·0	11·0	11·2
Time to reach maximum, minutes	65	100—130	70	70
Relative areas of radiation curves	42	72	77	79

* Size of coke is indicated as that passing through a screen of certain dimensions of square mesh, and remaining on one of smaller mesh—*e.g.*, 2¾ in. by 1 in. means coke passing through meshes 2¾ in. square, but remaining on meshes 1 in. square.

Ignition by Gas.—Much more concordant results were obtained by using a Méker burner placed centrally under the coke, burning a known volume of gas in a given time. Table I., tests 41 and 42, and figs. 5 and 6, illustrate this for a B.Th.U.



Note the contracted rate scale above 10 grammes per minute

Fig. 4.—Wood Ignition.

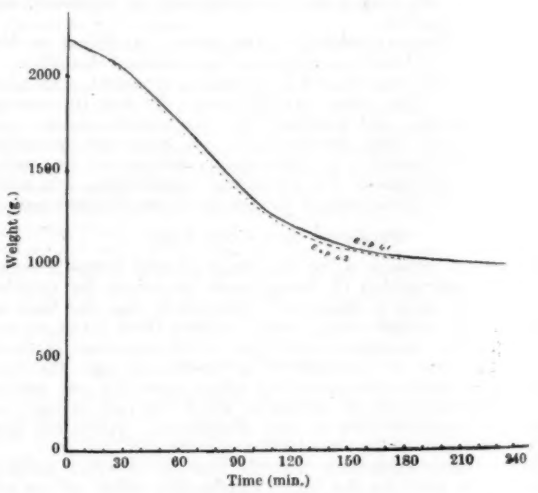


Fig. 5.—Gas Ignition.

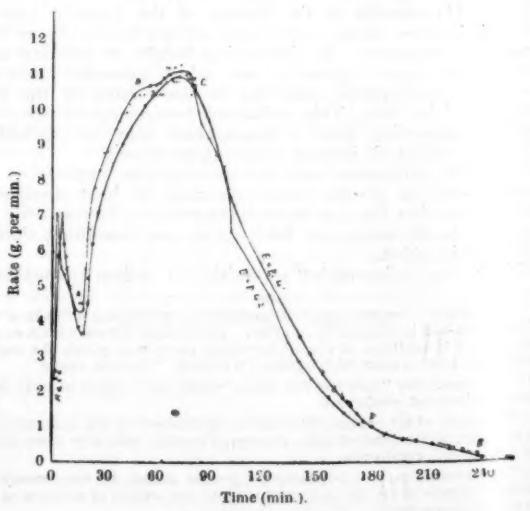


Fig. 6.—Gas Ignition.

input of 2850 in 20 min. The ignition of the coke was more localized by this method. It seemed probable that the slow spread of the combustion through the mass of coke would make it possible to obtain a better idea of the character of the coke from the point of view of ignition and burning.

Ignitibility.—It seemed probable that ignitibility could be measured by some form of standardized "trial and error" method based on the time taken by a given gas flame to heat the coke to just that point at which (when the gas flame was removed) it would continue to burn at a steady or increasing rate‖ allowing for the condition mentioned in the footnote. If the rate decreased after removal of the flame the coke would not be considered as having been properly ignited. The measurement could also be made by applying the flame for a definite time, but varying the rate of gas consumption and noting the gas used.

Preliminary experiments were made on these lines, but the method was slow, and it was therefore considered that time would be saved by obtaining information concerning the effect on combustibility of weight and grade of coke, type and dimensions of brazier, &c., using a gas flame which would ensure definite ignition. Such knowledge would probably facilitate a choice of the most suitable form or forms of ignitibility test.

Effect of Size of Coke Grade and Quantity Used.—A series of tests have been made under comparable conditions using three or four sizes of coke grade, and three different quantities for each size. The coke was from the same batch throughout the series.

The results are set out in Table II. and figs. 7 to 10, and some of the relationships noticeable are as follows.

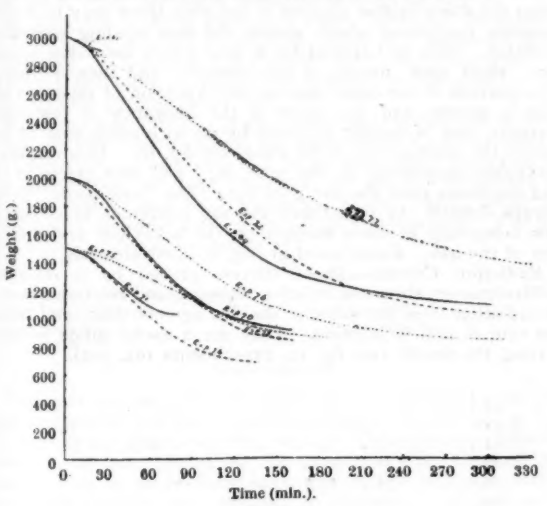


Fig. 7.

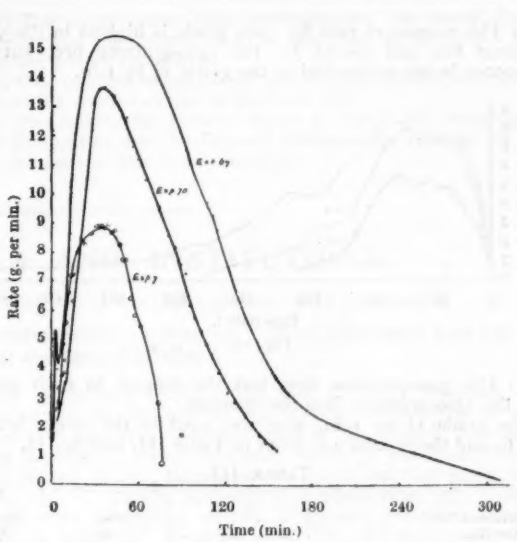


Fig. 8.

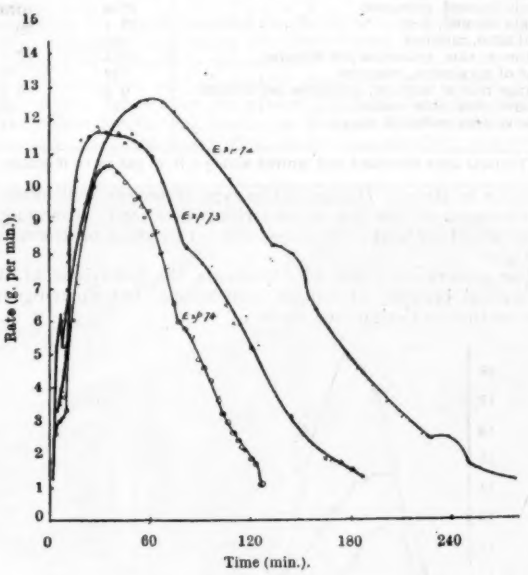


Fig. 9.

(1) *Effect of Size of Coke Grade for Each Quantity.*

(*a*) The percentage burned is highest for the 1¼ by 1 in. in all three quantities.

(*b*) The length of time the fire lasts increases with decrease in the size of grade.

(*c*) The maximum rate of burning for the 3000-gramme and 2000-gramme fires is reached by the grade 2 by 1¼ in., but for the 1500-gramme fire by the grade 1¼ by 1 in.

(*d*) The total relative radiation from the sides of the fire is approximately proportional to the total quantity burned.

(2) *Effect of the Quantity of Coke for the Different Sizes of Coke Grade.*

(*e*) The percentage burned is highest in all grades for the 3000-gramme fire and lowest in the 1500-gramme fire, but the differences are least marked in the grade 1¼ by 1 in.

‖ After removal of the flame there is nearly always a rapid increase in combustion, for a few minutes, due to a sudden uprush of air into the heated coke. This is owing to the fact that while the gas flame is being applied air is excluded to some extent from the neighbourhood. After a few minutes the effect of this disappears. (See fig. 6.)

TABLE II.—*Effect of Size and Quantity of Coke.*

Experiment No.	68	69	72	77	70	73	76	71	74	75	78
Coke grade, inches	3 by 2	2 by 1½	1½ by 1	1 by ½	2 by 1½	1½ by 1	1 by ½	2 by 1½	1½ by 1	1 by ½	½ by ½
Weight of coke, grammes	3000	3000	3000	3000	2000	2000	2000	1500	1500	1500	1500
Weight burned, grammes	463	1903	2000	1741	1085	1270	1160	477	815	645	429
Weight burned, p.ct.	15·4	63·4	66·6	59·0	54·2	63·5	58·0	31·8	54·3	43·0	28·6
Total time, minutes	120	300	320	510	160	200	300	80	130	200	360
Maximum rate, grammes per minute	8·5	15·5	12·3	8·2	13·6	11·8	7·8	8·9	10·9	5·5	2·0
Time of maximum, minutes	50	40	60	100	36	30	88	38	35	98	60
Average rate, grammes per minute	3·86	6·33	6·25	3·40	6·8	6·35	3·87	5·96	6·27	3·22	1·2
Relative maximum radiation from sides	0·7	1·8	1·75	1·15	1·45	1·35	1·0	0·7	0·9	0·45	0·2
Relative area radiation curve	37	160	171	142	70	101	82	26	42	33	28
Maximum rate / Maximum relative radiation	12·0	8·6	7·0	7·1	9·3	8·7	7·8	12·8	12·1	12·2	10·0
Weight burned, grammes / Total relative radiation	12·5	11·9	11·7	12·3	15·5	12·5	14·1	..	..	..	..
Total relative radiation × 100 / Weight burned	8·0	8·17	8·55	8·15	6·4	8·0	7·0	5·4	5·1	5·1	6·5
Total relative radiation × 100 / Total time	31·0	53·0	53·4	28·0	43·7	50·5	27·3	32·0	32·0	16·5	8·0

N.B.—Ignition was effected by 3 c.ft. of gas applied in 10 minutes, and brazier No. 4 was used in all experiments.

(*f*) The maximum rate for each grade is highest in the 3000-gramme fire and lowest for the 1500-gramme fire, but the difference is not so marked in the grade 1¼ by 1 in.

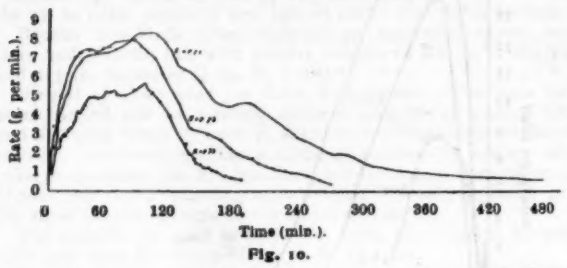


Fig. 10.

(*g*) The 3000-gramme fires last the longest in each grade, and the 1500-gramme fires the shortest.

The grade 1¼ by 1 in. was also tried in the larger brazier No. 6, and the results are given in Table III. and fig. 12.

TABLE III.

Experiment No.	104	105
Brazier No.	6	6
Coke grade	1¼ by 1 in.	1¼ by 1 in.
Weight of coke, grammes	6000	3000
Weight burned, grammes	4720	1993
Weight burned, p.ct.	78 7	66·4
Total time, minutes	500	200
Maximum rate, grammes per minute	22·2	18·7
Time of maximum, minutes	142	85
Average rate of burning, grammes per minute	9·4	9·9
Relative maximum radiation	27	18
Relative area radiation curve	407	125

Vertical coke was used and ignited with 3 c.ft. of gas in 10 minutes.

Effect of Brazier Design.—The type of brazier will affect the performance of the fire in two chief directions, depending on (1) its effect on heat dissipation, and (2) its effect on the natural draught.

The results in Table IV. illustrate the behaviour of three cylindrical braziers of similar dimensions, but differing from one another in design (see above).

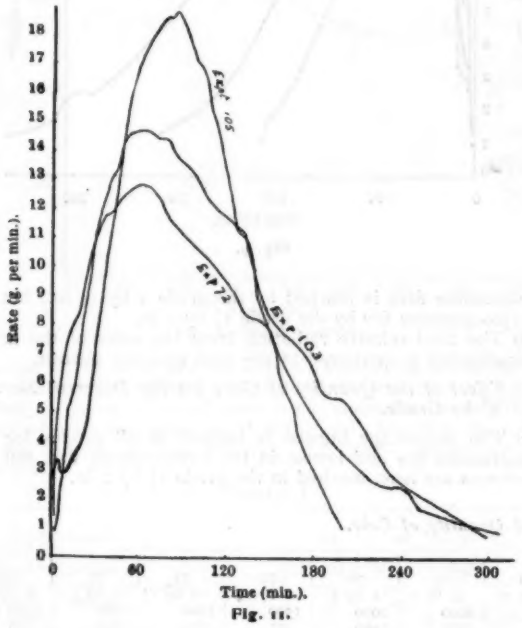


Fig. 11.

In experiment No. 17 the air had almost unrestricted access to the fire, and the coke did not properly ignite. In experiment No. 18, with the restriction due to the ashpan, the coke ignited and burned fairly well, and in experiment No. 16 with the restrictions due to the thick bars, together with the ashpan, the coke ignited and burned still better. These results demonstrate the great influence exerted by convection currents.

TABLE IV.

Experiment No.	16	18	17
Brazier No.	2	4	3
Size of coke	1 by ¾ in.	1 by ¾ in.	1 by ¾ in.
Weight of coke, grammes	1500	1500	1500
Weight burned, grammes	600	390	70
Time (total), minutes	150	120	99
Maximum rate, grammes per minute	6·4	4·65	1·37
Time of maximum	77	60	20

N.B.—Vertical coke was used and a gas ignition of 4 c.ft. in 20 minutes.

The effect of brazier dimensions is shown in the results given in Table V. and fig. 11 (see above for particulars of braziers).

TABLE V.

Experiment No.	72	103	105
Brazier No.	4	5	6
Grade of coke	1¼ by 1 in.	1¼ by 1 in.	1¼ by 1 in.
Weight of coke, grammes	3000	3000	3000
Weight burned, grammes	2000	2300	1993
Total time, minutes	320	300	200
Maximum rate, grammes per minute	12·3	14·7	18·7
Time of maximum	60	60	85

N.B.—Vertical coke was used and ignited with 3 c.ft. of gas applied in 10 minutes.

Tests 103 and 105 illustrate the effect of grate area and depth of fuel bed on the rate and quantity burned.

DISCUSSION OF THE TYPES OF CURVES OBTAINED BY THE WEIGHING METHOD.

The information given by the "weight-time" curve (*e.g.*, figs. 3 and 5, experiments 24, 25, 41, 42) is not very considerable, but the curves representing the "rate of loss-time" are much more informative (*e.g.*, figs. 4 and 6, experiments 24, 25, 41, and 42).

Another useful curve is obtained by plotting the rate of loss calculated as the percentage of the coke remaining, against the percentage of the coke remaining.

The Rate-Time Curve.—At the commencement of the test when the flame is first applied to the coke there may be a little moisture condensed which makes the first reading somewhat doubtful. This is followed by a loss which increases in rate for a short time, usually a few minutes, and then decreases. This portion of the curve depicts the expulsion of moisture and volatile matter and the effect of the buoyancy of convection currents, and is rapidly followed by an increasing rate of loss due to the combustion of the coke (see fig. 6). This reaches a maximum depending on the coke, &c., and then starts to fall and continues until the fire goes out. The "end-point" is not always definite, as sometimes the fire continues to smoulder, this depending in some manner on the behaviour and disposition of the ash. Experiment 41, fig. 6, illustrates this.

Radiation Curves.—These curves, plotted by a recording millivoltmeter, show the relative intensity and relative quantity of radiation from the sides of the fire against time, and follow the rate of loss in burning. They are a useful guide in interpreting the results (see fig. 12, experiments 104, 105).

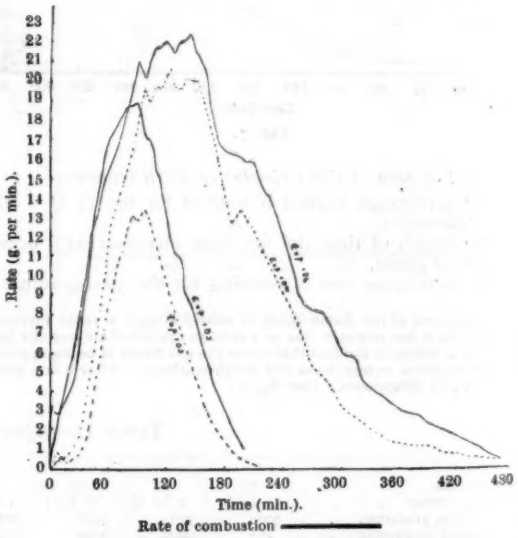


Fig. 12.

SUMMARY.

(1) The factors influencing the burning of coke in the domestic grate are discussed.

(2) The possibilities of a weighing method have been partly investigated for differentiating between the ignitibilities and combustibilities of different cokes for domestic use.

(3) Various quantities and sizes of lump coke were ignited and allowed to burn to extinction (under natural draught) in various modifications of cylindrical brazier suspended from one arm of a sensitive scale.

(4) The loss in weight involves moisture and volatile matter as well as loss by combustion, but records of the relative radiation intensities from the sides of the fires have been found helpful in interpreting the results.

(5) The important influence of size of coke, grade, height of fire, and natural draught so frequently experienced, but the effects of which are not always appreciated in domestic practice, are clearly demonstrated by the results.

(6) The duration and extent of burning (involving among other factors the influence of ash) and the maximum rate of burning are clearly shown for the different sizes of grade and quantities of coke used.

(7) The experiments have demonstrated the many factors involved and the difficulties to be overcome in devising a standardized test on these lines.

(8) The method is capable of giving much useful information concerning the behaviour of the coke fire.

In conclusion, the authors desire to thank the Birmingham Gas Committee and the General Manager for sanction to publish the data in this communication.

USES OF GAS IN HOSPITALS AND INSTITUTIONS.

By W. H. BECKET, Deputy Manager of the Special Service Section of the Gas Light and Coke Company.

Read at the Hospital Conference, Royal Horticultural Hall, Westminster, on May 26. The Conference was run in connection with the Institution of Engineers-in-Charge.

COOKING.

The use of gas in hospitals has increased enormously; and much of this is due to the reliability of the gas supply combined with the efficient service rendered by gas as a fuel. Hospitals throughout the country depend largely on gas for cooking, and generally employ gaseous fuel entirely for their kitchens. The Birmingham and Midland Hospital for Women; the Children's Hospital, Sheffield; the South Devon and East Cornwall Hospital, Greenbank; the Royal Eye Infirmary, Mutley, Plymouth; the Ministry of Pensions Hospital, Liverpool; and the Royal Infirmary, Hull, are a few examples selected at random.

At Hull, the cooking apparatus in the Infirmary provides us with a typical kitchen installation which any authority could safely copy. This comprises a double oven range, a single oven range, 2 hotplates, a vegetable steamer, 2 hot closets, and 6 coppers for greens, stews, &c.

In larger hospitals gas is generally used in conjunction with steam, as this combination is the most efficient and economical for large cooking installations. Some well-known instances are the Lodge Moor Hospital, Sheffield; the London Hospital; St. Bartholomew's; and St. Thomas's. At the latter, meals are prepared in the main kitchen for about 1300 persons. The gas and steam equipment consists of:

Gas—	*Steam*—
3 large confectioner's ovens	4 steamers
2 large roasters	4 coppers
2 hotplates	2 hot closets
2 grills	

MAINTENANCE.

Due care should always be given to the selection of the best gas equipment, and the installation should be kept up to date by introducing improvements, such as high-efficiency burners, which have been placed on the market during the last few years. This is particularly applicable to the hotplates, which have been considerably improved in efficiency. All gas ovens should be properly lagged to prevent loss of heat by radiation, and the smaller ovens should be mounted on legs, to facilitate the work of the staff.

Periodical maintenance and scrupulous cleanliness in the kitchen is a *sine quâ non*, if the highest efficiency is to be obtained from the plant. The British Commercial Gas Association are always ready to advise on these matters.

Gas for cooking is not confined to the hospital kitchen, but is universally popular in every sort of institution and home. This claim is substantiated by the fact that over 6 million gas cooking stoves are in daily use throughout the United Kingdom.

WARD KITCHENS.

Gas is rapidly superseding solid fuel in ward kitchens. Most of the general hospitals have already installed gaseous fuel for this duty, as no hospital or institution can afford the time or loss of efficiency consequent on the retention of coal, apart from any question of saving in dirt and labour, and the "always-ready-for-service" advantage which the gas cooker provides.

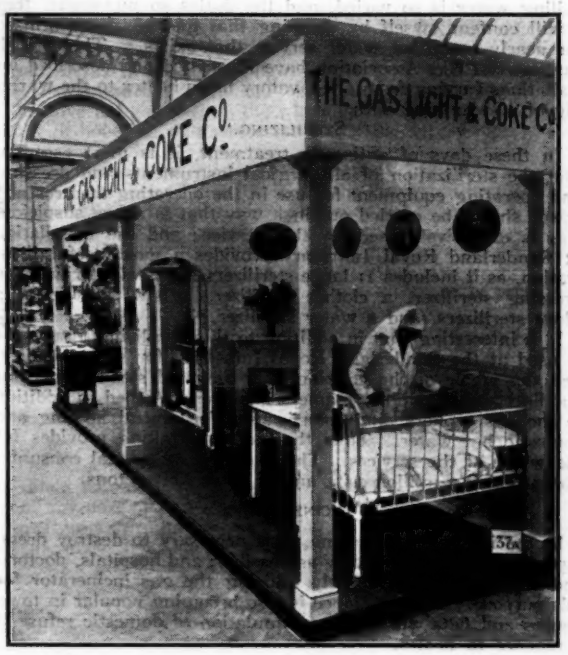
Mr. Evetts has kindly taken the chair to-night, as Mr. Cooper had to leave for the Continent at short notice; but I am sure Mr. Cooper would have endorsed these claims, as in his important post as Chief Engineer to the Metropolitan Asylums Board he is in a position to speak authoritatively on this subject. On his advice his Board are installing gas cookers in the ward kitchens of the large institutions under his charge. At the Royal Infirmary, Leicester, where gas does 80 p.ct. of the main cooking, there is a cooker in each of the 20 ward kitchens. There are also a gas fire and a sterilizer in every ward.

CLEAN HEAT.

Medical opinion is alive to the fact that the population of our cities is starved for sunshine, particularly for the ultra-violet rays, so it is only fitting that our hospitals should lead public opinion by doing their part to abolish smoke. This can best be effected by using clean heat, which gaseous fuel provides. It is very encouraging that so many hospitals have realized the possibilities of gas heating. I propose to quote a few instances from different parts of the country, to substantiate this claim: Royal Infirmary, Hull, 52 gas fires; Shaftesbury Society Home, Bournemouth, 25; Royal Infirmary, Glasgow, 15; St. John's Convent, Wolverhampton, 33; Bradford Corporation Hospitals, 28; St. Thomas's Hospital, London, 169; Westminster Hospital, 173; St. Bartholomew's Hospital, 123; and Uffculme Hospital, Moseley, 75 p.ct. of the heating.

Gas fires are being installed in all the wards at St. Bartholomew's Hospital; and when the installation is completed, the Hospital will be entirely smokeless.

Gas heating is so universally employed that there seems little need to dwell upon its advantages, but these are particularly evident in the sick room, as the gas fire combines clean heat with adequate ventilation, saves labour, dirt, and transport, and is invaluable when a regular temperature is required. The presence of dust in the air is an irritant, and tends to retard recovery in diseases of the chest and skin. The gas fire provides clean heat with a very high percentage of radiation, and is hygienically perfect. This accounts for its extended use in the hospital, the institution, and the home.



The Stand of the Gas Light and Coke Company at the Hospitals and Institutions Exhibition and Conference held in the Horticultural Hall, Westminster, on May 26, 27, and 28.

VENTILATION.

It would not be correct to leave the subject of gas heating without referring to ventilation. The coal fire flue has, by accident if not by design, provided a most valuable adjunct to the ventilation of the room during winter weather; and in my opinion no room should be built without a flue. Mechanical ventilation is all very well, but it is costly; while a properly constructed flue ventilates all the time with no running costs or maintenance charges.

There is an inclination, when providing for gas fires, to underestimate the size of flue required; so for the guidance of architects and builders I have prepared a short table of gas fire sizes with the minimum permissible flue area for each,

and the floor areas of the apartments for which they are suitable when used intermittently:

Number of Radiants.	Size of Gas Fire Front.	Minimum Permissible Flue Area.	Floor Area of Rooms.
5 and 6	8 in.	20 sq. in.	100 sq. ft.
7 and 8	10 ,,	24 ,,	150 ,,
9	13 ,,	30 ,,	200 ,,
10	14 ,,	36 ,,	225 ,,

Domestic Hot Water.

Coke is generally employed in large institutions and hospitals, where there is a constant demand for hot water. This smokeless fuel is used either under steam boilers or low-pressure units, but there are many cases where space or the intermittency of the load factor provides the opportunity for the use of gas efficiently and economically.

A good example is supplied by the installation of gas-fired boilers at the Hackney Borough Council's branch slipper baths at Wardle Street, Homerton. In this establishment there are 24 baths. The boilers and hot water storage are very compact, occupying a comparatively small area of the valuable floor space. This installation is operated by the bath attendants, saving the wages of the stokers which would be incurred if solid fuel had to be used. The cost works out at approximately 2d. per bath.

Gas was particularly suitable in this case, as in addition to the advantages outlined, the load factor proved to be very uneven; the peak load operating on Friday evenings and Saturday afternoons, on the other days the number of bathers being comparatively small.

Gas is extensively used for domestic hot water supply in smaller establishments, and for boiling water for tea making in the out-patients' department, service rooms, &c.

The application of gas to apparatus supplying hot and boiling water is so varied, and the duties so numerous, that I will content myself by claiming that gas has been utilized for nearly every hot water service that exists. The British Commercial Gas Association have illustrated and described installations varying from one lavatory basin heater to the warming of a swimming bath.

Sterilizing.

In these days of antiseptic treatment, it is most essential that the sterilization of all surgical instruments and dressing and operating equipment for use in the operating theatres and wards should be carried out in a way that is above suspicion. Gas is extensively used for this service; and the installation at Sunderland Royal Infirmary provides a most useful illustration, as it includes 11 large sterilizers, 15 small sterilizers, a dressing sterilizer, a clothes sterilizer, 2 bowl sterilizers, 2 glove sterilizers, and a water sterilizer.

It is interesting that in addition to this sterilizing plant, gas is used at the Sunderland Royal Infirmary for some heating, and the whole of the cooking. A gas-fired steam boiler for pudding and vegetable steamers has been installed in addition to the gas cookers, and coke is used for central heating and domestic hot water. Thus the gas undertaking provides for the whole of the services. The approximate annual consumption of gas is 7 million c.ft., and of gas coke 700 tons.

Incineration.

In the interests of hygiene, it is necessary to destroy dressings, swabs, &c., as quickly as possible; and hospitals, doctors, and dentists are increasingly utilizing the gas incinerator for this purpose. This appliance is also becoming popular in town houses and flats where the accumulation of domestic refuse is a menace to health.

Pasteurization of Milk.

In the interests of invalids and child patients particularly, it is necessary that any milk to be consumed by them in the raw state should be carefully pasteurized. Some hospitals have installed gas-fired pasteurization plants; and their example should be followed by all institutions such as clinics, children's welfare centres, &c., where it is absolutely essential that the milk supplied should be above suspicion.

Refrigeration.

In America the provision of a refrigerator is looked upon no longer as a luxury, but as a household necessity. With the application of the restricted use of preservatives in food, this condition will shortly operate in this country. Then refrigerators will become common objects of furniture in all well-equipped ward and domestic kitchens. It only needs the public to realize that the new cabinet refrigerator can be operated with gas at a consumption of about 2 c.ft. per hour, or 7 hours per 1d., to create a demand for refrigerators. Large numbers have already been installed in hospitals and institutions, but this market is only just being developed.

The Laboratory.

No hospital, institution, or factory is properly equipped if it does not contain a laboratory. Politicians, manufacturers, and all responsible for the management of our institutions are fully alive to the fact that the "old rule-of-thumb" methods are dead. Modern conditions demand the active co-operation of the scientist, not only in medical research, but in industry.

Gas plays an all-important part in the equipment, as gas bunsen burners, incubators, and water heaters are essential. In fact, gas is required for any investigation requiring the application of heat.

Steam Raising.

The outstanding necessity in a hospital is rapid preparation for an operation at any time of the day or night; and it is here that the gas-fired steam boiler demonstrates its undoubted advantage over all other types of fuel fired boiler.

Steam may be raised from cold to full working pressure in 25 to 30 minutes from the time of lighting up; and if the boiler is still hot from a previous run, this time may be reduced to 15 or even 10 minutes. Lighting-up a Spencer-Bonecourt gas-fired boiler is an operation which can be accomplished by any person, male or female, blessed with average common sense, and may be likened to the lighting of a geyser or ordinary domestic gas fire. The possibility of making the boiler entirely automatic as regards both gas and feed water control is an undoubted economy, rendering it possible to dispense with the services of skilled men to stand by during the 24 hours, in preparation for a possible emergency. On the other hand, in spite of the absence of skilled attention, the automatic controls faithfully carry out their work, and ensure a constant supply of steam at full pressure, thus adding to the confidence of the hospital staff. Another saving is effected in that, directly steam is no longer required, the gas may be shut off, and the cost ceases, while the staff are secure in the knowledge that, even if another urgent case is presented within the next few hours, an almost instantaneous supply of steam is available.

This flexibility and economy is impossible to obtain with coal, coke, or oil fired boilers, all of which require a skilled man to operate, and which, compared with gas-fired boilers, are very slow steam-raisers.

The heating of swimming baths is also a duty which is admirably and efficiently performed by town gas. The usual procedure is to empty and refill the bath, and heat up to the required temperature during the night. Here also the gas fired unit may safely be left to perform its work without supervision.

A typical installation of this type, where the prime movers are Spencer-Bonecourt patent town gas fired water heaters, is to be found in the Retford public baths.

Figures of a test carried out during the night of August 17-18, 1924, are given below:

Duration of test	9 hours.
Contents of bath	56,390 galls.
Gas meter reading, start	359,100 c.ft.
Gas meter reading, finish	377,000 ,,
Total gas used	17,900 ,,
Gross calorific value of gas	490 B.Th.U.
Temperature of water in bath, start	58½° Fahr.
Temperature of water in bath, finish	72° ,,
Total gas consumption in B.Th.U.	17,900 × 490 = 8,771,000
Total heat input into bath water	56,390 × 13·5 × 10 = 7,612,650 B.Th.U.
Efficiency = $\frac{7,612,650}{8,771,000} \times \frac{100}{1}$ =	86·8 p.ct., including all radiation losses from all sources in 9 hours.

Gas fired steam boilers are obtainable in sizes vaporizing from 50 to 2000 lbs. of water per hour, with a gas consumption of about 2·59 c.ft. per lb. Many gas fired steam boilers are in use for various duties, including hospitals. For example, gas steam boilers have been installed at the London Temperance Hospital, the Royal Free Hospital, the London Homœopathic Hospital, &c.

Gas in Industry.

During the last twelve years the consumption of gas for industrial purposes in that portion of London served by the Gas Light and Coke Company has increased from 652 million c.ft. to 1662 millions, or more than 154 p.ct.

All the gas undertakings in the large industrial centres, such as Birmingham, Manchester, Sheffield, Newcastle, &c., have well-equipped industrial showrooms where the services of chemists and technical engineers are available to advise on any trade process requiring the application of heat. Manufacturers are welcomed with their problems, as the application of gas in many industrial processes increases production and reduces costs, and works to the mutual advantage of the manufacturer and the gas undertaking.

In this brief summary of the uses of gas in hospitals and institutions, I feel that we can claim that, though the gas industry is 115 years old, it is by no means suffering from senile decay, but, on the contrary, it is a very live force, operating for hygienic conditions in the home, hospital, institution, and factory, while at the same time the increasing use of gas is a very material factor in smoke abatement.

MEASUREMENT OF MEAN SPHERICAL CANDLEPOWER.

PHOTOMETRIC INTEGRATORS.

[Abstract of a Report of the Department of Scientific and Industrial Research (Illumination Research)].

The tendency towards the general adoption of mean spherical candlepower, or luminous flux, as the rating for light sources has necessitated the equipment of photometric laboratories with the apparatus for its rapid and accurate measurement. Illumination Research Technical Paper No. 5 of the Department of Scientific and Industrial Research—"The Measurement of Mean Spherical Candlepower"*—describes the methods to be recommended in this field of photometry.

The work has been carried out by the Photometric Division of the National Physical Laboratory at the request of the Electric Lamp Committee of the British Engineering Standards Association.

Rating of Light Sources.

Until recently it has been customary to rate light sources in terms either of their candlepower measured in some convenient direction, or, more often, of the average value of the candlepower measured in all directions of a specified plane. For example, in the case of an upright incandescent gas mantle, the average value of the candlepower measured in all planes perpendicular to the axis of symmetry of the mantle—the mean horizontal candlepower—has been the ordinary figure of candlepower associated with the source. For some sources, however, such as high-pressure gas units for street lighting, the m.h.c.p. rating is valueless; and these sources have frequently been rated in terms of the average value of their candlepower measured below the horizontal—the mean lower hemispherical candlepower.

Modern developments have necessitated a revision in the method of describing the output of light sources; and it is now realized that the most practical rating is in terms of the total light production of the source rather than its candlepower in any particular direction. There are two ways of expressing the total light output of a source. The quantity is proportional to the average value of the candlepower of the source measured in all directions in space. This average value—the mean spherical candlepower—may be determined by measuring the candlepower in a large number of directions equally distributed in space about the source, and taking the average of the values thus obtained. Alternatively the conception of luminous flux may be introduced, for the candlepower of a source in a given direction is proportional to the rate at which luminous energy is emitted per unit solid angle from that source in the direction considered. The total luminous flux given by a source, measured in lumens, is equal to its mean spherical candlepower multiplied by 4π.

Measurement of M.S.C.P.

Apparatus has been designed so that the mean spherical candlepower can be determined by a single measurement. In this apparatus—to which attention was drawn in an article in the "Journal" for May 4, p. 295—one side of a photometer head receives by reflection a fixed fraction of the light emitted from the source in each of a practically infinite number of directions equally distributed in space about the source as origin. The simplest form of such apparatus consists of a hollow sphere, whitened internally, and having the source at or near its centre. This sphere is provided at one point with a small translucent window which is screened from the direct light of the lamp; and the brightness of this window, due to light reflected from all parts of the sphere surface, is, under certain conditions, proportional to the mean spherical candlepower of the source within the sphere.

Theory of the Integrating Sphere.

The theory of the sphere depends upon the fact that a matt surface absorbs a portion of the light it receives, and reflects the remainder in such a way that it appears equally bright no matter what may be the direction from which it is viewed, or what may be the manner in which the incident light is distributed as regards direction. No ideal surface is known to exist, but some surfaces are close enough approximations for certain photometric purposes.

If a sphere be coated internally with a diffusing surface of the kind described, the luminous flux received by a given area of the spherical surface from any other given area is independent of the relative positions of these two areas on the sphere. The illumination of the spherical surface by *reflected* light is everywhere the same. It is only the light received by the spherical surface directly from the source, that is unevenly distributed.

From this theory, it follows that if it were possible to obtain a sphere with a perfectly diffusing surface, to support a light source anywhere within this sphere without obstructing any of the reflected light, and to measure the reflected light reaching any point of the sphere surface without disturbing that surface by the introduction of a photometer, then the problem of measuring mean spherical candlepower would be solved. These three conditions can, of course, never be fully realized in practice. All that can be done is to attempt to comply with them as closely as possible.

Absolute measurement by means of the sphere is out of the question; and some form of substitution method must be used. One method consists in the simple substitution of the test lamp for a sub-standard of known mean spherical candlepower, and the calculation of the unknown m.s.c.p. The other system is less obvious, but in certain circumstances more accurate. Both sub-standard and test lamps are in the sphere together during both measurements. In this case three screens are employed, one preventing any of the direct light of the sub-standard from reaching the test lamp.

Effect of Objects within the Sphere.

The influence of an object in disturbing the equality of distribution of reflected flux over the surface of the sphere increases with the size of the object, its absorption factor, and its closeness to any part of the surface. The effect of an object of given size is reduced by whitening its surface, by placing it as nearly as possible in the centre of the sphere, and by increasing the reflection factor of the sphere surface. Generally the screens are flat circular discs painted on both sides with the same paint as that used for coating the internal surface of the sphere.

When a sub-standard of the same type as the test lamp is available, so that the accessory apparatus is approximately of the same size and shape, and similarly situated in both measurements, the true substitution method may be employed. As an additional precaution it is desirable to whiten the outside surfaces of all auxiliary apparatus, excluding those surfaces which act as secondary sources of light (*e.g.*, shades and reflectors, &c.). When the sub-standard and the test lamp are very different in size or type, or in light distribution, it is better to use the "simultaneous" method already described. In the case of an inverted gas burner, the whole of the upper surface of the shade or hood, as well as the outside of the supply pipe, should be painted white. The under surface of the shade or hood should, however, be left in its normal working state, as otherwise the amount and distribution of the flux given by the whole lamp, considered as a complete unit, will be altered. Where the "simultaneous" method is used, the surface area of the sphere should be at least forty times as great as that of the test source and its accessories.

The true substitution method of measurement is preferable to the "simultaneous" method, but it demands a larger integrator. When the former system is employed, the ratio of the surface area of the integrator to that of the light source (including any surfaces such as shades, reflectors, &c.) should not be less than 100 times the ratio of the absorption factor of these surfaces to the absorption factor of the sphere surface.

Screen and Window.

The screen used with each source should be just large enough to shield the whole of the window from the direct light coming from any part of that source which contributes to the total flux from it under ordinary working conditions. Each screen should be placed at a distance from the window equal to about two-thirds of the distance from the window to the source.

The window should behave as nearly as possible as a perfect diffuser for transmitted light. It should be neutral as regards colour, and its inner surface should be matt and truly flush with the inner surface of the integrator. Its diameter should not exceed one-tenth of the diameter of the sphere, and should preferably be smaller than this. Instead of a glass window, a simple aperture may be used; a small auxiliary whitened sphere being fitted over this aperture. The whole of the flux reaching the window aperture is thus admitted to the smaller sphere; and, by a second application of the theory of the whitened sphere, it follows that the brightness of the wall of the auxiliary sphere is proportional to the flux entering that sphere —*i.e.*, to the flux reaching the aperture from the walls of the principal sphere. If, then, the surface of the auxiliary sphere be made one of the comparison surfaces of a photometer, the auxiliary sphere acts as a perfectly diffusing window.

The report considers at some length the choice of a suitable internal coating for an integrating sphere. The paint at present used at the National Physical Laboratory consists of a mixture of zinc oxide and gelatine in water; the whitest procurable zinc oxide and as nearly as possible colourless gelatine being employed for the purpose. The paint thus prepared has a slightly yellow tinge; and this is corrected by the addition of a small quantity of powdered blue. The paint should have a reflection factor of at least 80 p.ct.

Non-Spherical Photometric Integrators.

In spite of the great advantages of the sphere, the ease of construction of the cube, and its compactness, have led to its

* Published by H.M. Stationery Office, Adastral House, Kingsway, W.C.2; price 1s. net.

wide adoption in commercial photometry. An attempt has been made to effect a compromise between the sphere and the cube, by the insertion of triangular pieces at each corner of the latter, so that the internal space is bounded by a surface having fourteen faces roughly tangential to a sphere of diameter equal to the side of the cube. The report states that the results obtained by the use of such an integrator ought to be very little inferior in accuracy to those obtained by means of a sphere. The same conclusion applies to the regular iosahedron, which has been used as a photometric integrator.

Other forms of integrator have been employed for measurements other than that of mean spherical candlepower. For the determination of mean hemispherical candlepower, a sphere with a large opening at the top is used; and for the measurement of the total flux in the beam of projection apparatus, the integrating hemisphere has been employed.

METALS RESEARCH ASSOCIATION.

Improving Engineering Materials.

The Seventh Annual Report of the British Non-Ferrous Metals Research Association, which has just been issued, describes its work during 1926, which has been carried out at a cost of over £25,000. The field covered is wide, as the scope of the Association embraces all the principal non-ferrous metals, such as aluminium, copper, lead, zinc, nickel, &c.

The history of engineering shows how closely advance has depended on the improvement of materials. Other countries are keenly alive to the value of scientific research, and are striving to attain and surpass our position by work very similar to that carried out by the Research Association. The co-operative system of sharing the costs of industrial research, which is rendered possible by the Research Association scheme, enables members to secure the full results by individual subscriptions amounting to only one-hundredth to one-thousandth of their cost.

The report gives details of the 27 researches which have occupied more than forty scientific investigators during the past year. Problems are being studied such as atmospheric corrosion, the production of sound castings, lead pipes, materials for high-temperature service, &c.

In connection with the annual meeting of the Association, a luncheon was held at the Savoy Hotel on May 27. At this Sir Alfred Mond emphasized the increasing influence of university trained men in industry. Scientific training along broad lines was most important not only in the research departments, but also on the production side and even in salesmanship. Sir Alfred urged the importance of research with a wide outlook directed to the development of new processes.

Sir Frank Heath, in making a last appearance before retiring from his post as Secretary of the Department of Scientific and Industrial Research, suggested that research should be looked upon as a form of provision against depreciation. Knowledge, like plant and machinery, must be regarded as a wasting asset; and new supplies of knowledge were only available to those who made them their own by active co-operation with the scientific workers who were providing them.

Further particulars of the Association's work can be obtained from the Secretary, 71, Temple Row, Birmingham.

BENZOLE-HEATER AND GAS-MAIN DEPOSITS.

In the "Iron and Coal Trades Review" for May 27 it is mentioned that at an "Associates Night" meeting of the Midland Section of the Coke Oven Managers' Association, held in Sheffield recently, a paper on "Benzole Heater and Gas-Main Deposits" was read by Mr. W. Green, assisted by Mr. M. D. Edington (Manvers Main Collieries, Ltd.). The authors' attention was drawn to the problem several years ago by a combination of two facts—viz., a spontaneously ignitible deposit and an explosion in a benzole pre-heater at a bye-product coke oven works. The deposit just referred to was taken from a gas main supplying crude coke oven gas to a gas-works, and it had the property of igniting itself at 80° C. From information of a qualitative character in the authors' possession they knew there were certain similarities between this deposit and one from a benzole oil preheater; and they decided to investigate such deposits with a view to finding out if they were spontaneously ignitible. The deposit tested contained approximately 25 p.ct. of creosote oil; and in order to obtain a sample for analysis, the authors took a portion of the original material, and removed the creosote oil from it by successive washings with ether. The ignition temperature of the original deposit as obtained (including creosote oil) was 195° C.; and after removal of creosote oil, sulphur, and tarry matter, 190° C. A further experiment on the oil-free material was tried by removing the soluble salts by extraction with dilute hydrochloric acid; and the ignition temperature of this treated sample was raised to 205° C. Thus it would appear that the removal of substances which were easily oxidizable raised the ignition temperature. The authors held the view that the dangerous character of the deposits emphasized the care which should be exercised in dealing with any piece of works plant which might contain them. Thus, for example, some vessel containing such a deposit, possibly of low ignition temperature, might have been steamed out to clean it; and assuming the presence of gases of light hydrocarbon vapours, it needed no stretch of imagination to picture what might happen on the admission of air to such a plant when in this heated condition.

EXAMINATION OF THE PRODUCTS OF COMBUSTION FROM COAL GAS FLAMES.

Further Work by Hamilton Davies, B.Sc., and Harold Hartley, D.Sc.

The results of an investigation by Hamilton Davies and Harold Hartley on "The Determination of Traces of Carbon Monoxide" were published in the "JOURNAL" for June 9, 1926, p. 530. The authors have since then carried out further work on the subject; and their findings are published in the "Journal of the Society of Chemical Industry" for June 3, under the title "An Examination of the Products of Combustion from Coal Gas Flames." The following is a summary:

(1) The iodine pentoxide method of determining carbon monoxide has been used to investigate the combustion products from flames. An accuracy of between 1 and 2 parts per million has been attained.

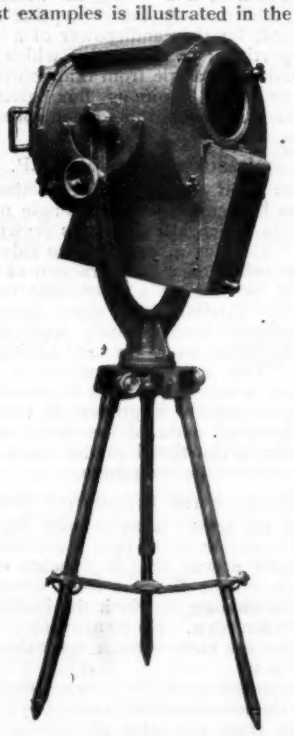
(2) Flames burning in the air of an ordinary room appear to emit traces of carbon monoxide.

(3) An endeavour has been made to calculate the ratio between the carbon monoxide and dioxide in the undiluted products of combustion; and the mean values found for this ratio for the well-aerated bunsen, poorly-aerated bunsen, and luminous flames are respectively 0·00024, 0·00034, and 0·0001.

(4) The concentrations of carbon monoxide in the undiluted dry products have also been calculated, and for the three types of flame are 31, 44, and 13 parts per million respectively.

A NEW PROJECTOR.

The London Electric Firm, of South Croydon, have specialized in the development of searchlight projectors; and one of their latest examples is illustrated in the photograph.



The projector is designed to give close range lighting over a large area, and it may be used for interior as well as exterior illumination. Portability and lightness of construction are important factors in the design, but the outstanding novelty is the patented method of obtaining a widely diverging beam of light, which is variable with the "focus gear" up to at least an included angle of 50° and the light field is evenly illuminated and free from shadows. A 12-in. mirror is used. A similar projector is made in the 18-in. size.

These projectors provide effective close range illumination, and are now considered to be an important item in the equipment of modern fire-fighting services.

STEAMING IN CONTINUOUS VERTICAL RETORTS—THEORY AND PRACTICE.

By NORTON H. HUMPHRYS.

(*Concluded from p. 507.*)

IV.—CARBON DIOXIDE.

Carbon dioxide in the gas may be regarded as burnt carbon—irrespective of the several, and perhaps successive, reactions of which it is the final product—which under more favourable conditions could add to the calorific value of the gas, in the form either of hydrocarbon compounds or of carbon monoxide. The specific gravity is three times that possessed by the combustible constituents, so it increases the weight of the gas and the consequent cost of distribution. It is the worst offender in the matter of reducing flame temperatures, and is known to be an active metal-corroding agent in presence of moisture.

The quantities set forth in Table III., columns 3 and 4, are those retained by the gas after purification in the usual course, and do not represent the contents of samples taken at the outlet from the retort, having experienced liberal treatment with ammoniacal liquor and clean water in the washers and scrubbers. Ammonia in solution is known to be capable of taking up a larger quantity of carbon dioxide than is required to form the monocarbonate, and clean water at ordinary temperatures will dissolve its own volume. Given an ammonia content of 5 lbs. per ton of coal carbonized, some 7 or 8 lbs., equivalent to 60 to 70 c.ft., may be extracted in the washers and scrubbers; and the chances are that a larger quantity would be taken out from a gas containing 6 to 7 p.ct. than from a purer sample. The content shown in Table III., columns 3 and 4, cover the wide range of 12 to 160 lbs. per ton, so the correction that should be added to the maximum in order to get at the retort outlet content is only 5 p.ct.; but the minimum must be increased to the extent of 40 p.ct. So the difference is important when dealing with moderate proportions of this impurity. Under heavy steaming as much as 8 p.ct. at the retort outlet is not uncommon, equivalent to 21 p.ct. by weight. Comparing columns 3 and 4, there is a gain of 148 lbs. (D and H), equal to 40 lbs. of carbon, 94 of carbon monoxide, or 53 of methane. On an extreme case of 200 lbs. of carbon dioxide, there would be a loss equivalent to 54 lbs. of carbon, 127 of carbon monoxide, or 72 of methane. In event of the last-named compound being formed, there would be a debit for loss of free hydrogen taken into combination. The gross gain of calorific value is 17¼ therms, the deduction for hydrogen 11, and the actual or net gain 5¼ therms. As carbon monoxide, there would be a net or actual gain of 5¾ therms. The heat produced by burning carbon to carbon dioxide is 0·14 therm per lb.

TABLE III.—*Carbon Dioxide and Nitrogen.*

—	P.Ct.	C.Ft.	Lbs.	Gain Lbs. (4)—D	Equivalent to Increase in		Nitrogen.		
					C.	CO	P.Ct.	Lbs.	C.Ft.
D. . . .	0·80	105	12·0	..	..	..	7·9	77·0	1041
E. . . .	1·40	230	26·2	14·2	3·9	9·0	8·9	108·2	1462
F. . . .	3·50	702	80·1	68·1	18·6	43·4	6·7	103·3	1394
G. . . .	4·50	1018	116·1	104·1	28·4	66·3	5·8	97·0	1310
H. . . .	5·50	1409	160·0	148·0 (4)—B	40·4	94·2	6·5	123·2	1664
B. . . .	1·85	222	25·2	..	..	..	8·0	71·2	960
1. . . .	1·85	278	31·8	6·6	1·8	4·2	9·1	101·5	1372
2. . . .	3·85	688	78·5	53·3	14·6	34·0	7·5	98·0	1325
3. . . .	5·50	1055	120·0	94·8	25·8	60·4	5·6	79·5	1075
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

Certain qualifications must not be overlooked. Carbon dioxide supplied by furnace gases inspirated through defects in the retort walls is not to be reckoned as a loss on the coal; and the heat produced by combustion in the retort is not entirely wasted. Internal combustion is known as the most economical method of supplying the heat required for carbonization, but its application is limited by the proportion of carbon dioxide that can with all-round satisfaction be retained in the gas supplied to the district. The absence of a reasonably cheap and efficient process for removal of this impurity from gas has always been recognized as a defect; and until it can be remedied, the use of internal combustion to any important extent is not practicable. The substitution of pure oxygen in place of air avoids the introduction of a large surplus of nitrogen, but does not assist matters in any other respect. If the internal combustion could be confined to hydrogen, there would be no trouble so far as the quality of the gas was concerned; but the removal of an appreciable quantity of that constituent would be disadvantageous in many other respects.

A close association between the quantity of steam admitted and the production of carbon dioxide is indicated by the increases from D to H, and B to 3, in columns 2 and 3; and the advance is sufficient to constitute a disadvantage attending the use of steam in quantity. The production per ton of coal carbonized is the chief consideration in the retort house and in connection with carbonizing problems; but the percentage contained in the gas is more important in the district. As will be seen by column 2, this increases much slower than the actual quantity per ton, because, with each addition of steam, there is a larger total production of gas. The increases in column 3 as between D and H are in the ratio of 1 : 13; and in B and 3, 1 : 5. But those for the same items in column 2 are only in the ratio of 1 : 7 and 1 : 3 respectively. Really the ratios are something considerably less, on account of the approximately equal quantity removed in the washers and scrubbers, which ranges from 40 to 5 p.ct. of the totals.

V.—NITROGEN.

The arrangements for preventing or diminishing the introduction of air into the retort can be carried to a greater degree of refinement in special investigations, as conducted by the Fuel Research Board or the Institution of Gas Engineers Committee, than is possible at moderate sized gas-works. But even under these favourable conditions, the percentage of nitrogen is erratic, and frequently approaches 10 p.ct. In ordinary practice as much as 12 to 13 p.ct. is not unusual. In Table III., column 10, the nitrogen content is shown as anything between 960 and 1664 c.ft. per ton of coal carbonized. Of this quantity, but a trifling proportion is introduced into the retort by the staple material. The total content of the coal used in tests D to H averages 1·4 p.ct. (Fuel Research Board Report, 1920-21, p. 47), of which the coke retains about one-half (*ibid.*, p. 49). Therefore not more than 212 c.ft., or 15·7 lbs., can be traced to the volatile compounds obtained from the coal, and none is likely to be introduced with the steam. The bulk of it is due to exterior sources, and the only available means of supply are either air or furnace gases. The origin of such large quantities, and the exact location of entrance into the retort, are both interesting and important problems. The oxygen content of the gas is an infallible indication of the contribution obtained from the atmosphere.

Answers to inquiries about pressure conditions existing inside the retorts are usually to the effect that a slight positive pressure is maintained, perhaps one to two tenths. If this condition is strictly correct, the only way by which nitrogen could get into the retort would be osmotic action of gases differing in specific gravity and temperature, between the exterior and interior surfaces. The possibility of such action through substantial thicknesses of fireclay, silica, or cast iron might account for a small fraction, but not for 13 p.ct., which means 16 p.ct. either of air or furnace gases, one-sixth of the total make of gas, or not far short of 400 c.ft. per hour. Official experiments are presumably conducted on sound retorts, a condition that cannot always be assured in ordinary practice.

There is more feasibility in the assumption that different pressure conditions may obtain at the two ends of a long retort, and that an indication of two-tenths positive at the outlet does not guarantee that the same is continued right through to the base. In a horizontal retort, there are no disturbing causes other than a possible pull caused by hot rarified gases passing up the ascension pipe, which is not more, during the principal part of the charge, than is required to overcome the friction due to rapid travel. As the charge approaches a spent condition, the speed of evolution falls, the area of the eduction pipe becomes large as compared with the quantity of gas to be removed, and a chimney-like action to the extent of a pull amounting to one-tenth or so may be established, with the result that air or furnace gases are drawn in, which may explain the known low quality of the tailings obtained under intermittent working. Under the continuous system there are no tailings, or cycles in the quantity and quality of gas produced, corresponding to those obtained from intermittent charges. The horizontal retort requires only one mouthpiece joint and one lid joint, but the vertical must have two mouthpiece joints, and the charging device is not likely to be absolutely air-tight. Analyses of samples of gas taken from various localities in the retort would afford useful information.

A chimney possessing the most suitable horizontal area for the work to be done, 25 ft. effective perpendicular length, has been known to give a pull equal to 3 or 4 tenths of an inch of water, when dealing with the usual products of combustion, which are heavier than atmosphere when measured at N.P.T. Gases having only about half the specific gravity of air may be expected to give a stronger pull, so a positive two-tenths pressure at the outlet from a retort is not inconsistent with a decided negative at the base. A minimum pressure throughout is obviously desirable, but not easy of maintenance in all parts of a 25 ft. retort. As much may be said in respect of a steady gauge. Oscillations of pressure are as objectionable in a vertical as in a horizontal retort.

VI.—OXYGEN.

Carbonizing engineers have no special reason for feeling grateful to oxygen. Apart from a small residue in the free state, it appears in the gas as carbon oxides, of which only the monoxide possesses any saleable value—and that nothing to boast of, as 22½ lbs. by weight must be consumed in order to

produce one therm. To the gas from unsteamed coal, it contributes 3 to 4 therms per ton of coal, which by hard steaming may be increased to 16 or more. The maximum attainable under the theoretical reaction is about 38. In Table IV. the quantity of oxygen conveyed into the retort in coal or steam is compared with that present in the gas and as water in ammoniacal liquor. Strange divergencies are evident, especially with the larger quantities of steam; but in a general way there is some relationship between percentages of steam and oxygen content in the products. The fixed salts in the ammoniacal liquor will contain a small quantity, and the tar will also include some oxygen compounds.

Col. 3, Table IV., compared with the carbon monoxide content of the gas (Table I.), illustrates the small proportion of the oxygen introduced by the steam which possesses saleable value; and the remainder is worse than useless.

TABLE IV.—*Oxygen, Lbs. per Ton.*

—	Average in Coal, *less* Moisture.	In Steam.	Total.	In Gas.	In Liquor. —	In Liquor. *Less* Moisture in Coal.	Gain (7) − D.	Total (5) + (7).
D	146	..	146	55·0	139	119	..	174·0
E	146	101	247	106·6	139	119	..	225·6
F	146	249	395	198·7	208	188	69	386·7
G	146	411	557	258·8	276	256	137	514·8
H	146	601	747	339·6	356	336	217	675·6
B	193	..	193	69·5	..	..	..	..
1	193	101	294	106·1	157	125	..	231·1
2	193	252	445	177·3	188	156	31	333·3
3	193	401	594	232·6	275	243	118	475·6
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

The usual assumption is that oxygen contained in coal, other than in water held mechanically as such, is in combination with hydrogen in the first place, rendering the quantity so held of no thermal value. This is a feature of the common formula for expressing the calorific value of coal by calculation from its composition as shown by ultimate analysis, and the results agree fairly with the positive figure obtained by means of an accurate calorimeter. In the low-temperature assays conducted by the Fuel Research Board, the water yield is much lower than is obtained with high-temperature distillation, being only 2 to 3 p.ct. for the English and 4 for the Welsh coal—say, 4 to 9 gallons per ton. Any water present as hydrates might be expected to be displaced at the temperature employed (1112° Fahr.).

In terms of weight, hydrogen is by far the most active combustible constituent contained in coal gas. One pound is as good as 14 lbs. of carbon monoxide, 2½ of methane, or rather less of heavy hydrocarbons. The quantity lost by combination with oxygen is therefore an important consideration.

A favourite reflection with opponents of existing carbonization systems is the small proportion of the total calorific value obtainable from the coal which is passed into the gasholders, rather overlooking the fact that carbonizing engineers are out for financial in preference to theoretical considerations. In the unfortunate event of no funds available for dividend, disconsolate shareholders are not likely to find comfort in improved theoretical statistics. Attention may well be directed to the thermal value represented in the tar and liquor wells. From the first, liquid products have been regarded as a disadvantage that might well be dispensed with; and increase in that direction is certainly an objection.

VII.—Air Admitted to the Gas after Leaving the Retort.

The percentages of nitrogen and oxygen contained in the purified gas may be increased by the admission of a measured quantity of air at the inlet of the oxide purifiers, for the purpose of revivification *in situ*. Presumably not more oxygen is thus admitted than will be absorbed in the purifiers; but as the total free oxygen rarely exceeds 1 p.ct., a slight surplus may make a lot of difference. The nitrogen is not affected, and can easily be estimated and allowed-for. If the exhauster is after the condensers, or from other causes a long and tortuous line of pipes exists between the hydraulic main and the exhauster inlet, there is a chance of drawing small quantities of air, through slight defects. These can be reduced to a negligible quantity, and the excess of nitrogen admitted after leaving the retort should not exceed 2½ to 3 p.ct. Thus, after making every reasonable allowance, nearly 10 p.ct. of nitrogen remains unaccounted-for.

VIII.—Coke.

The losses in weight of coke, shown in Table V., may be regarded as pure carbon. The products from intermittent charging are known to retain as much as 2 p.ct. of volatile matter, equivalent to 30 lbs., or nearly 3000 c.ft. per ton of coal. (Alwyne Meade, "Modern Gas-Works Practice," p. 283.) But the analyses show that the volatiles in the samples of coke now under consideration are so small that they need not be taken into account. As much may be expected after 16 to 18 hours' exposure to heat in the retort. According to theory, the loss of weight as compared with the production from similar, but unsteamed, coal should be about two-thirds that of the steam decomposed. But examination of Table V., cols. 7 and 8,

TABLE V.—*Loss of Coke with Steaming.*

—	Yield per Ton, Cwt.	Loss. D−(2)	Ditto, Lbs.	Carbon. Cwt. in Coke.	Carbon. Loss. D−(5)	Carbon. Ditto, Lbs.	Steam Decomposed. Lbs.	Carbon. In Gas.	Carbon. Gain. Lbs. (9)−D
D	14·46	..	..	12·91	..	..	..	172	..
E	13·88	0·58	65	12·41	0·50	56	113	221	49
F	13·30	1·16	130	11·50	1·41	169	219	272	100
G	13·24	1·22	137	11·81	1·10	123	293	310	138
H	12·76	1·70 B−(2)	190	10·74	2·17 B−(5)	243	352	358	186 (9)−B
B	14·40	..	..	12·80	..	..	..	166	..
1	13·83	0·57	66	11·62	1·18	132	113	206	40
2	13·55	0 85	96	11·11	1·69	189	170	246	80
3	13·28	1·12	126	10·71	2·09	234	217	273	107
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

shows that the results obtained in practice are erratic, and bear no fixed proportion, due to increase of hydrocarbons, as already noticed. The extent of the divergencies is remarkable, and, like several other matters, they appear to follow the accidental conditions of the moment rather than fixed laws. These observations also apply to the carbon content of the gases as set forth in Table V., cols. 9 and 10. The effect of steaming on the appearance and on the ash content of the coke are important practical questions. The first may be left out of consideration, as there is no change sufficient to attract the attention of a customer. But the ash content of many retort house cokes is already so high that the increase due to steaming is not desirable. Some recent consignments of coal to gas-works show a marked improvement, and are, in fact, equal to pre-war quality. Where heavy steaming is the rule, the ash content of the coal used acquires increased importance.

When comparing the ash contained in the coal with that from the resulting coke, allowance must be made for the altered weights of percentages. The whole of the ash contained in the coal passes on to the residual coke, possibly subject to some slight alterations caused by chemical reactions, the bulk of which have been already accounted-for in estimating by the usual methods. The residue obtained after burning-off the combustible constituents is probably different from the incombustible as it existed in the coal when purchased. One per cent. in a ton of coal will represent 1·43 p.ct. on a make of 14 cwt., and 1·53 p.ct. on 13 cwt. The following figures are extracted from the Fuel Research Board Practical Paper No. 10, as obtained from Welsh coal:

Ash in coal, p.ct.	9·45 ..	9·96 ..	10·0
,, the coke, p ct.	13·19 ..	14·82 ..	15 92
,, coal, lbs.	212 ..	223 ..	224
,, the coke, lbs.	203 ..	205 ..	236

Coke from a vertical retort comes out sufficiently cool to admit of immediate conveyance to the yard without addition of water—an advantage as compared with douched coke, which suffers from spalling due to the sudden reduction of temperature, and also retains mechanically a quantity of the quenching fluid. Excess of water tends to accumulate near the bottom parts of the heap; and prejudice to sales may be caused by a specially wet consignment being delivered to a regular customer. Complaint is made, he inspects the coke—a thing he may not have done for years—forms an unjust opinion that he has seen an average sample, and decides to transfer his patronage elsewhere. The superiority of smothered over douched coke is not a new discovery, and proposals have been made, from time to time, for dispensing with the use of cooling water. The vertical coke contains little, if any, moisture, makes a smaller proportion of breeze, and therefore sells to better advantage. If the stock is supplemented by horizontal coke from a distance at a time when the demand exceeds home

TABLE VI.—*Liquid Products.*

—	Steam, Lbs. Supplied.	Steam, Lbs. Used.	Steam, Lbs. Excess.	Tar, Gallons. Yield.	Tar, Gallons. Gain. (5)−D	Water, Lbs. Yield.	Water, Lbs. Ditto, *less* Moisture in Coal.	Water, Lbs. Gain.
D	..	..	..	9·34	..	156	134	..
E	113	113	..	11·60	2.26	152	130	..
F	279	219	60	11·22	1·88	234	212	78
G	460	293	167	12·47	3·13	310	288	154
H	673	352	321	12·56	3·22 (5)−B	400	378	244
B	..	..	..	7·0*	..	177*	141	..
1	113	113	..	9·22	2·22	141	141	..
2	282	170	112	10·60	3·60	211	175	34
3	449	217	232	11·78	4·78	309	273	132
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

* Estimated from D and E.

supply, complaints may be expected, and customers will ask for a mixture with vertical coke.

IX.—STEAMING AND LIQUID PRODUCTS.

A 5 p.ct. addition of steam does not increase the production of water (ammoniacal liquor), but adds some 25 p.ct. or so to the yield of tar. See Table VI., cols. 5 and 8. Larger quantities exercise a smaller effect on the tar, but an increase is maintained with each increment. The highest advance in tar is 4·78 gallons (B and 3), or nearly 70 p.ct., and the gain in liquor is, of course, assisted by any excess of steam, but is erratic, and shows no relationship therewith (cols. 4 and 9). One would prefer to see the gain in tar transferred to the gas; and the probability is that the greater part is produced by low-temperature distillation near the outlet from the retort. One might reasonably expect a less yield from the vertical than from the horizontal retort, and a lower yield with continuous than with intermittent charging. The yield of therms increases substantially with heavier steaming, and the question is whether it is worth the direct and indirect price that must be paid for it, which will depend on the saleable value of coke and other local conditions.

Institution of Mining Engineers.—The eighty-sixth general meeting of the Institution will be held at Newcastle-upon-Tyne on Wednesday, Thursday, and Friday, June 29 and 30, and July 1. Included in the programme are visits to the coke oven and bye-product plant and the modern works for the manufacture of silica bricks of the Consett Iron Company, Ltd.; the Wardley Colliery of Messrs. John Bowes & Partners, to inspect the "Birtley" coal cleaning plant; and the Team By-Product Coke Company's Works.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Measuring the Make of Gas.

SIR,—Many years ago I was asked to assist a small country company in the matter of its gas supply. The plant comprised an engine which drove the exhauster and furnished what other power was required for pumps, &c., and two holders which gave a pressure, if my memory serves me correctly, of about 2 in. and 5 in. respectively. In the course of my conversation with the manager, he told me he never used the heavier one unless he was compelled, because, he continued, "I get a better make of gas with the other." I endeavoured to explain to him that this difference was illusory, and that this particular factor governing the percentage he sold depended upon the pressure his governor was adjusted to supply his district.

I am doubtful whether I succeeded, but since that time another generation has come into being with whom a complete knowledge of the physical attributes of gases has been included in their preparatory education. But the possession of knowledge is one thing, its application to everyday affairs another; and for this reason you may think it of sufficient interest to print some references to the circumstances which led this Company to adopt its present practice in respect of the measurement of its make of gas.

The Phœnix Company had a large and a medium size works under respectively the late C. Woodall and P. J. Wates. There was generally a difference in favour of the latter of several hundred cubic feet per ton of coal. Woodall excused the deficiency; Wates took credit for the gain.

In 1880 the Company amalgamated, Woodall retired, and Wates took over the larger works. He found himself unable to reach his previous standards. But the management was no longer inspired merely by the payment of a 10 p.ct. dividend. Livesey believed, if not in a high make per ton, at least in the usefulness of between-works comparisons. The solution to the mystery was found when it was pointed out that whereas at one works the station meters were within a stone's throw of the purifiers, at the other they were at Kennington, about half a mile away, and the reduction in temperature of the gas by passing so long a distance along the earth accounted for the difference. As a result, readings for barometric and temperature measurements were taken simultaneously with the indexes, and the latter readings corrected to a common standard. Later on the barometer containers were coupled direct to the station meter inlets (using double taps so that the columns could be verified by opening to atmosphere and comparing with a standard instrument), thereby eliminating any errors due to heavy or light holders and reducing meter indications to the true standard of 30 in. and 60° Fahr.

The resultant figures are those which have been used and furnished by this Company for a great number of years, and they are specially useful now that the adoption of the therm system encourages the preparation of definite balances of carbonizing efficiency. I may add that for convenience and simplification our station meter indexes have been altered to read direct in therms (uncorrected for pressure and temperature) and the gasholders are similarly calculated and tabled. A systematic method of temperature records also provides important information for differentiating between what is often called unaccounted-for gas, true leakage, and unpaid-for gas. There was an interesting paper upon the subject read by the late Frank Livesey before the Incorporated Institution of Gas Engineers and recorded in its transactions.

CHARLES CARPENTER.

South Metropolitan Gas Company,
709, Old Kent Road, S.E. 15,
June 7, 1927.

Glasgow Corporation Chemical Works Department.

SIR,—I note in his last letter Mr. Tudsbery speaks of "extravagant claims." Only one "extravagant claim" has been made, and that was when Mr. Tudsbery stated the debt incurred by this Department at erroneous figures, which I fully exposed in a previous note.

In my address to the Junior Gas Association, I stated nothing beyond what is to be found in the audited and certified accounts of the Glasgow Corporation Gas Department. Mr. Tudsbery having, I understand, legal qualifications, will, of course, know the limit to which he can go in impugning audited and certified accounts, and the usefulness of so doing. I have privately, and in your columns, referred Mr. Tudsbery to the "'Gas World' Analysis of Municipal Gas Accounts" and "Field's Analysis," which are compiled from the published accounts of the Corporation; and those interested can, of course, make any comparison they wish.

Finally, as the Corporation Mr. Tudsbery cites in proof of his theory applied to Glasgow for information with a view to the installation of its own Chemical Works prior to the publication of my address, his remark on this point is as futile as it is cheap, and is also unduly flattering to the plain statement of facts in my address.

J. MACLEOD, Manager.

Glasgow Corporation Chemical Works Department,
June 4, 1927.

British Benzole Mixture.

SIR,—In view of the recent propaganda appertaining to Soviet petrol, we would like to make the position quite clear as far as the products sold by this Company are concerned.

National Benzole Mixture is composed of benzole produced from British coal, and petrol refined within the Empire. It is produced and distributed entirely by British labour, and exploited by British enterprise and capital. In short, it is completely British.

Many of your readers, no doubt, will welcome this official statement.

NATIONAL BENZOLE COMPANY, LTD.

Wellington House,
Buckingham Gate, London, S.W. 1,
May 31, 1927.

High Price of Gas Oil.

SIR,—With respect to the above subject, which is one of practical interest to gas undertakings possessing carburetted water gas plants, the present quotations would seem to be readily explicable when the relevant conditions in the oil industry are considered.

In the early days of carburetted water gas in this country, the petroleum industry was in a very different position from that now obtaining. Kerosene, or lamp oil, was then the main product aimed at by oil refiners, and gas oil was a mere subsidiary product—to be cleared out of the way at any price it would fetch. Then came in gradually the demand for motor spirit, followed by the demand for liquid fuel for furnace working and for use in internal combustion engines—demands which in the course of a few years brought, it might be incidentally mentioned, immense fortunes to oil producers and oil refiners, as they rendered valuable every fraction of the crude oil, from the light-spirit end right down to the heaviest fuel.

Since those early days, too, great changes have been made in refinery practice. Straight distillation procedure has been reinforced by various systems of "cracking," having for their object the extraction of larger quantities of those particular products which happen to be in most request in the world's markets. The consequence is that gas oil as a refinery product does not hold the same position as formerly. There need now be no production of gas oil at all; for it may be remarked that a gas-making oil can be split-up into other fractions, some of which have a market value considerably higher than gas oil. The presence of these valuable fractions in the gas oil gives that product a definite commercial value. If they were extracted, the residue might be sold at a lower price; but it is a matter of conjecture as to whether that lower figure would compensate for the loss of gas-making efficiency caused by the absence of those fractions.

It seems to the writer, therefore, that there must be a re-shifting of trade demands in the oil market before a lowering of the price of gas oil can be expected.

WILLIAM H. HARVEY.

77, Montholme Road,
Wandsworth Common, S.W. 11,
June 4, 1927.

REGISTER OF PATENTS.

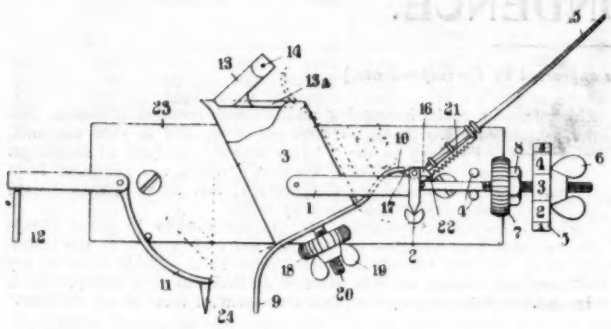
Mechanism for Doling-Out Predetermined Quantities of Liquid.—No. 270,132.

A SECRETARY OF THE BOARD OF TRADE and BOYS, C. V., of Victoria Street, S.W. 1.

No. 18,345; July 22, 1926.

This invention relates more particularly to water-flow gas calorimeters, and has for its main object to determine the quantity of liquid with greater accuracy than hitherto. A further object is to provide means for quick and exact adjustment if the instrument should have been wrongly set or if a new and different quantity of liquid should be wanted.

The invention is particularly applicable in connection with recording calorimeters such as described in specification No. 180,080 [see "JOURNAL," Vol. 158, p. 688], but is available generally where exact quantities of liquid are required to be supplied at predetermined intervals.



Modification of the Boys Calorimeter.

We reproduce a diagrammatic side elevation of a convenient construction of the invention. A balance beam 1 rests on knife edges 2 disposed below the centre of gravity of the beam system. A tilting bucket 3 is pivoted at one end of the beam and the two limits of movement of the beam are determined by stops 4, 4 (the bucket being shown dotted in its tilted position). The other arm of the balance beam carries counterweights 5 and 7, which are provided respectively with locknuts 6 and 8. The positions of the bucket 3 relatively to the beam 1 in its tilted and erect positions are determined by two arms 9 and 10; the former limiting the angle of tilt by abutting the cross-bar of the beam or abutting the support 2 of the beam (as indicated in dotted lines). The bucket does not remain in this tilted position for more than a moment, since immediately the liquid begins to run out the bucket tends to right itself. It is then, however, immediately arrested by the pawl 11 which engages the pouring lip of the bucket. The last water remaining in the bucket dribbles therefrom by way of this lip. The end of the pawl 11 is provided with a pair of strips 24 of metal spaced about 1 millimetre apart, these serving to drain the last drop from the bucket by capillary action. The liquid is delivered by the bucket and pawl into a receptacle placed below, from which it passes on for use. The fixed parts are carried by a plate 23 screwed to the back of the calorimeter casing.

The pawl 11 is withdrawn at regular intervals of time, determined by a clock movement, by the action of a push rod 12, whereupon the bucket 3 rights itself and brings the tubular receiving spout 13, which is carried by a lid 13a securely fixed to the bucket, into the path of a horizontal water jet which continuously discharges in a direction parallel to the pivoting axes of the beam and bucket and strikes the spout at the spot 14. As, however, any rebound which would be caused by the upper arm 10 striking a rigid abutment would be undesirable, there is provided a pneumatic buffer consisting of a feather 15 secured to a swivel piece 16 which carries also a short arm 17 on which the arm 10 strikes. Owing to the shortness of the arm 17 and the length of the feather, the latter makes a rapid stroke through the air, thus absorbing the energy of the righting bucket and causing the bucket to come quietly to rest without rebound; consequently not a drop of liquid is lost by splashing. A light spring 21 or weight is provided to hold the feather support against a stop 22 in its quiescent position. A dashpot or other form of pneumatic damping means may be substituted for those described, if desired.

As will be seen from the figure, the beam is in unstable equilibrium, in consequence of which when once the balance beam begins to tilt it does so with acceleration, and the spout clears the jet with alacrity, so that the regularity of the successive weights of liquid doled out is assured. Water delivered in this way is constant within 1 in 4000 or thereabouts, or ¼ lb. per ton, which is the amount delivered in a week to one particular calorimeter.

In order that the balance may weigh correctly, the bucket 3 must not tip or begin to tip on its own account until the balance beam 1 has tilted and has been arrested by the upper stop 4. Then if the construction of the bucket and its poise are suitable the bucket will continue its motion and discharge its contents. In order to adjust the poise readily and to make it suit various quantities of liquid (as may be needed, say, for the examination of various qualities of gas), the bucket is provided with a counterweight 18 and locknut 19 on a screwed tail 20, so that the poise may be adjusted. As will be evident from the drawing, the centre of gravity of the empty bucket is below the trunnion axis, while that of the full bucket is above; and this is essential to successful operation.

In applying the present invention to the calorimeter described in specification No. 180,080, it is advantageous to make the weight 5 and locknut 6 together weigh twice as many grammes as the screw on which they are carried has threads to the inch; the trunnion axis of the bucket being placed 2 in. from the knife edge of the balance beam. Consequently one turn of the weight 5 and locknut 6 will correspond to one gramme of water in the bucket more or less according to the direction of turning for each weighing. This enables the balance to be set conveniently for the usual changes in declared calorific value of the gas tested. Actually 5 p.ct. more grammes of liquid is required in five minutes for ten tips at the bucket than is required for the declared calorific value of the gas in B.Th.U. It is also desirable to make the weight 5 ten-sided, and stamp the numbers 0 to 9 upon its faces. Then each unit of such numbers corresponds to one gramme in ten tilts of the bucket, and great accuracy of setting is possible and can be quickly effected.

Improving the Working and Thermal Efficiency of Water-Gas Plants.—No. 269,221.

MELLERSH-JACKSON, W. J., of Southampton Buildings, W.C.

[A communication from the WESTERN GAS CONSTRUCTION COMPANY, of Fort Wayne, Ind.]

No. 25,082; Oct. 8, 1925.

The invention relates to water gas production in plants comprising a single generator, single carburettor, and single superheater, and has for its object to provide a method and apparatus for economically manufacturing carburetted or blue water gas in increased quantities and of high quality, and largely through the utilization of the heat derived from the manufacture of the gas, which is stored in the elements of the apparatus.

The invention consists in providing a method and means for passing air blasts successively in both directions through the single generator, single carburettor, and single superheater between runs, thereby recovering surplus heat from the superheater and carburettor and restoring it to the fuel bed and fully conditioning the fuel bed from both above and below.

The invention also provides that the products of combustion resulting from the reverse passage of the air blast through the single generator, and constituting rich air blast gas coming from the bottom of the generator, may be conducted through suitable connections into the wash box and thence to the relief holder and gas main.

Another feature is that the hot water which overflows from the wash box or hydraulic seal, and which carries a considerable amount of heat acquired from the outgoing gases, is utilized to charge the air of the reverse air blast with a high percentage of moisture or water vapour, thereby causing the reverse air blast to absorb more readily and rapidly the sensible heat in the superheater and carburettor than would be possible were the reverse air blast composed of dry air alone.

As a further feature of the invention, at the conclusion of the reverse air blast and prior to the gas making run, by reversing the necessary valves the air blast may be permitted to go forward again through the apparatus in the usual manner, thereby urging the air out of the carburettor and superheater and filling these two chambers with rich air blast gas. The air blast gas so formed combines with the gas resulting from the subsequent admission of steam in the usual manner to produce a high quality gas to be conveyed to the wash box or hydraulic seal and relief holder.

An alternative means of urging the set of air at the conclusion of the reverse air blast would be to introduce steam into the top of the generator, to pass downwardly through the carburettor and up through the superheater. Or the elements may be purged by admitting steam to the top of the superheater, thence upwardly through the carburettor in a reverse way and in the direction of the recently completed reverse air blast. In accordance with another embodiment of the invention the reverse air blast may take place at the end of the gas making period and prior to the main or forward air blast run, and be discharged to the atmosphere through the generator stack. In this latter embodiment the carburettor and superheater are reduced in temperature and purged of carbonaceous deposits, and the fuel bed in the generator is raised to the desired temperature by the reverse air blast from the superheater and carburettor passing downwardly through the fuel bed, and prior to the escape of the air blast through the generator stack.

The patentee claims that the invention achieves the manufacture of high-quality water gas with a decreased fuel consumption accompanied by a more complete combustion and consumption of the fuel bed in the generator, as well as of any portion of unconsumed fuel which may have escaped from the generator into the carburettor.

Approximately four pages of print and two figures are given to describe the plant in detail; but we need only state here that the generator, carburettor, superheater, and seal box are connected together in the manner usually used in standard water-gas apparatus, with the exception that it is claimed that the elimination of the hot valve results in a much simplified connection between the generator and carburettor. The general details of the necessary doors, linings, dimensions, and so forth are the same as in ordinary water-gas apparatus, and their particular arrangement is not essential to the proper functioning of the present invention.

In operating the plant, a preferred cycle is an up blast of air through the generator, down through the carburettor, up through the superheater, and out through the stack. Then a reverse blast

of air down through the superheater, up through the carburettor, and down through the generator, through a pipe connection to the inlet of the tar batter or hydraulic seal. This is followed by an up run which consists of steam up through the generator, down through the carburettor, up through the superheater, and into the wash box. During this up run, oil is admitted to the top of the carburettor and flows with the gas and undissociated steam into the wash box. The up run is followed by a down run in which steam is admitted to the top of the generator and passed down through the generator, through the pipe connection from the bottom of the generator into the wash box. No oil is put in during this period. This is followed by a short up run, the same as the previous up run, but without any oil. This concludes one cycle, and the next cycle is started by again air blasting in the upward direction.

Gas Generators.—No. 270,429.

PATENT RETORTS, LTD., of Norfolk Street, W.C. 2, and DAVIDSON, T. M., of Hatch End.

No. 4122; Feb. 12, 1926.

This invention has for its object to effect the complete gasification of coal, coke, or other similar carbonaceous substance, and to produce a gas rich in hydrogen and free from condensable hydrocarbons; and it relates to that type of gas generator in which the generator proper is disposed beneath a retort in which the coal is first distilled and from which it passes on carbonization into the generator proper to be completely gasified.

A feature is that the down run may be continuous or that the up run and down run may be of approximately the same duration.

According to the invention, the hot gas is caused to pass downwardly through one generator—that is to say, through the charge in the retort and through the charge in the gas generator proper beneath it—and thence upwardly through a flue or conduit into the top of the superposed retort of a second generator, and thence through the charge in the gas generator beneath the second retort. Thus the stream of gas from the first generator as it passes through the second generator is augmented in volume by the gas produced there. At the end of one cycle the direction of the gas stream may be reversed.

The invention is especially applicable to a known construction of gas generator of the type referred to in which a series of radial passages or flues are provided in the setting in position above the generator proper leading to spaces of annular or other shape surrounding the retort disposed above the generator proper, in which spaces chequer brickwork is provided. Thus according to a modification the hot gas after passing from one generator may pass down the retort of a second generator, and, instead of passing through the charge in the generator proper disposed beneath, may pass through the radial series of passages or flues referred to, and up through the chequer brickwork surrounding the retort.

The plant is illustrated and described in detail in the specification.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 1.]

Nos. 13,729—14,442.

AIRD, K.—"Thermostatically-controlled valve devices." No. 14,272.

ARMSTRONG, C. H.—"Means for thermostatically controlling flow of fluid." No. 14,312.

CHILOWSKY, C.—"Apparatus for manufacturing gas from heavy oils." No. 14,334.

COLEMAN, F. S.—"Gas-burner regulators." No. 14,250.

DOLPHIN, J.—"Automatic control apparatus for gas burners." No. 13,903.

DONALD, W.—"Distillation of coal, &c." No. 14,374.

DUCART, G.—"Gas heater for curling-irons." No. 14,425.

DUCART, G.—"Gas operated air heating device." No. 14,426.

FERRANTI, LTD., and FERRANTI, S. Z. de.—"Meter indicator mechanism." No. 13,800.

FRANCIS, S. S.—"Gas fired boilers." No. 13,841.

GENERAL GAS APPLIANCES, LTD.—See Coleman, F. S. No. 14,250.

GORDON & CO., LTD., J.—See Armstrong, C. H. No. 14,312.

HAWES, F. O.—"Apparatus for indicating calorific value and pressure of gases." No. 14,291.

HILL, F. S.—"Gasfittings of ball joint type." No. 14,014.

HODSON, P.—"Gas or electric fires." No. 13,890.

HOWLETT & CO., LTD., M.—See Dolphin, J. No. 13,903.

I. G. FARBENINDUSTRIE AKT.-GES.—"Production of valuable products from coal, &c." No. 13,820.

LAING, B.—"Manufacture of water gas." No. 14,430.

LEWIS, G. M.—"Gas burners, &c." No. 13,733.

MASCHINENFABRIK AUGSBURG-NURNBERG AKT.-GES.—"Gasometers." No. 14,421.

NATIONAL GAS ENGINE CO., LTD.—"Internal-combustion engines." No. 13,799.

NIELSEN, H.—See Laing, B. No. 14,430.

PRESTAGE, A. J. R.—"Gas mantles." No. 14,437.

RAYBOULD, A.—See Lewis, G. M. No. 13,733.

ROBERTS, R. P.—See Hodson, P. No. 13,890.

SILICA GEL CORPORATION.—"Separation of gases." No. 14,095.

SOUTH METROPOLITAN GAS COMPANY.—See Prestage, A. J. R. No. 14,437.

SPENCER-BONECOURT, LTD.—See Francis, S. S. No. 13,841.

TOWNSON & COXSON, LTD.—See Hill, F. C. No. 14,014.

WILLIAMS, G. A.—"Automatic gas regulator." No. 14,184.

YATES, H. J.—See Dolphin, J. No. 13,903.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Matlocks Urban District Council and Stoke-on-Trent Corporation (Gas) Bills: Returned from the Commons, with the amendments, agreed to.

Smethwick Corporation Bill: Brought from the Commons; read the first time, and referred to the Examiners.

Wallasey Corporation Bill: Read the third time, passed, and sent to the Commons.

HOUSE OF COMMONS.

Progress of Bills.

Coventry Corporation Bill: Read a second time, and committed.

Greenock Burgh Extension Bill: As amended, considered; to be read the third time.

Matlocks Urban District Council Bill: The Lords amendments considered, and agreed to.

Smethwick Corporation Bill: Read the third time, and passed.

Wallasey Corporation Bill: Read the first time, and referred to the Examiners.

Imports of Gas Mantles.

Mr. HARRIS asked the President of the Board of Trade whether he could give the figures of the imports of gas mantles for the year previous to the imposition of the safeguarding duty and for the last financial year, respectively, or the most convenient comparative periods.

Sir P. CUNLIFFE-LISTER replied that the safeguarding duty came into force at the end of December, 1925. The imports of gas mantles during 1925 amounted to 208,902 gross. In 1926 the imports were 47,708 gross.

Mr. HARRIS further asked if Sir P. Cunliffe-Lister was aware that the reason for the falling-off of imports was the fact that the largest English manufacturer of these mantles had paid a bonus to the German manufacturers not to send them into this country.

Sir P. CUNLIFFE-LISTER answered that he was aware that there was an agreement with regard to markets. He was also aware that, but for the duty, the imports would be enormous, and that we should not be able to find a market for our own products.

Low-Temperature Carbonization.

Viscount SANDON asked the President of the Board of Education (1) what were the conditions existing in Westphalia which made low-temperature carbonization of even low-grade coal a commercial success which were said not to be at present applicable to this country; and, if there were none, what still hinders the commercial adoption of this process in the United Kingdom; (2) what countries were at present utilizing processes of low-temperature carbonization on a commercial basis, and to what extent in each case.

Lord E. PERCY replied that he was not aware of any low-temperature carbonization process being worked successfully on a large commercial scale and using the type of coal available in this country. Such plants as existed were either experimental or working under special conditions on a comparatively small scale. If he was supplied with the further particulars of the process or processes referred to as being a commercial success in Westphalia, he would endeavour to give the information desired.

LEGAL INTELLIGENCE.

A QUESTION OF INCOME-TAX.

In the Irish Free State Court of Appeal, an appeal by the Alliance and Dublin Consumers' Gas Company from a decision of the Special Commissioners for the Purposes of Income-Tax was listed on a special case stated on the Revenue side. The question for the decision of the Court was whether the Special Commissioners were right in holding that a sum of £784 16s. 9d. received by the Gas Company from the British Government in consequence of the compulsory detention of steamships belonging to the Company during the coal strike of 1920 was chargeable to income-tax.

Arguments having been heard,

Mr. Justice SULLIVAN, giving judgment, said that he thought that the fair reading of the facts was that the Gas Company's share of the money paid by the British Government was in respect of loss for the use of their ships, and if that were the fair reading, it was obvious that the payment must be taken into account in estimating the profits. He thought that gain had been acquired, and was of opinion that the decision of the Commissioners was correct, and that the sum was properly taken into account for assessment.

Mr. Justice HANNA and Mr. Justice O'BYRNE concurred.

The Court accordingly answered the Commissioners' question in the affirmative.

Malta and Mediterranean Gas Company, Ltd.—After appropriating the sum of £3000 to reserve, the amount standing to the credit of profit and loss at March 31 last was £20,869. The Directors propose the payment of the dividends on the first and second preference capital, and a dividend of 4 p.ct. (free of income-tax) on the ordinary capital, making with the interim dividend 7½ p.ct. for the year. This will leave a balance of £16,141 to be carried forward.

MISCELLANEOUS NEWS.

WEATHERING THE STORM AT BOLTON.

A Successful Year.

In his report on the working of the gas undertaking for the year ended March 31, Mr. THOMAS GLAISTER (Chairman of the Bolton Gas Committee) states:

"The past year has been a record one both as to results obtained and as to difficulties overcome. It is generally accepted that the gas industry of the country as a whole faced the difficulties of the coal dispute with credit, and I am pleased to say that the Bolton Gas Department did its full share quietly and efficiently. It was a time of great anxiety to myself and the whole of the Committee, for during the period when coal was almost unobtainable the Department was called upon to provide gas at the rate of 30 p.ct. over the normal supply. As the existing plant had already been called upon to supply more than its normal capacity, we were faced with a possible shortage of gas, and it was found necessary to bring into use old and obsolete plant. Careful investigation and research on the carbonizing processes were carried out, and showed us a means of utilizing this plant to a higher capacity, and enabled us to obtain the yield of gas sufficient to cope with the demand. At no time was the supply of gas curtailed; and I consider the services of the Engineer and his staff should be referred to.

"Financially the Department has weathered the storm satisfactorily. The higher costs, and working expenses which were inevitable have been rather more than met by the temporary increase in the price of gas, and by the greater quantity of gas sold. This latter constitutes a record for the Department. The year's results show a gross profit of £77,025, and a net balance on the year of £9932. The sum of £14,000 has been placed to the renewals fund, and £9645 to the capital account, leaving a balance carried forward of £40,167.

"The difficulties of the past year interfered seriously with the anticipated procedure of the renewals and extensions of manufacturing plant. The necessary extensive repairs at the Lum Street Works due to be carried out last year were held-up completely by the coal dispute, and are this year having to be undertaken under difficulties, as this station is carrying the full load during this summer to permit of extensions at the Gas Street Station. These much needed extensions at Gas Street were seriously delayed last summer, but are being fressed forward with all speed to enable us to make use of this new plant for the heavy winter load which has to be faced.

"The alterations and improvements of the showroom have had a marked effect in influencing the sales of gas. A further improvement is now in hand with the object of still further developing the usefulness of this department. The sale of gas apparatus during the past financial year constitutes a record."

BARROW CORPORATION GAS UNDERTAKING.

At a meeting of the Barrow-in-Furness Town Council on Monday, May 30, Alderman R. THOMPSON, Chairman of the Gas and Water Committee, presented his report upon the past year's working of the gas and water undertakings. He traced the effect of the coal dispute locally, and said that 11,091 tons of foreign coal were purchased from American and Continental sources. The prices paid for foreign coal materially affected the financial results of the year. The price of gas was not increased until the dispute was over, in December, and then only by 6d. per 1000 c.ft., and the price of coke remained stationary until October, 1926. The most satisfactory feature of the year's working of the Gas Department was the large increase in the quantity of gas sold—39,480,000 c.ft., or 13 p.ct.

For the first two months of the current financial year, the increase in gas sent out had been 16 p.ct. No fewer than 1003 additional consumers were connected during the year, 921 being on Walney Island. The total number of consumers was now 14,671. The number of gas cookers on hire at the end of March was 11,550, being an increase of 1142 over the previous year. Good progress had been made with the work in connection with the supply of gas to Walney Island, which was now nearing completion. This work would have been finished but for the fact that operations had to be suspended owing to shortage of materials brought about by the coal dispute.

Dealing with the Gas Department accounts, he said the sum of £10,287 had been expended on capital account in respect of new mains, services, meters, and stoves, the bulk of which was in connection with the supply of gas to Walney Island. With regard to revenue account, coal had cost £18,799 more than last year, due to the increased prices paid and also to the fact that 500 tons more had been used. Oil and coke for the manufacture of carburetted water gas cost £6534 more; 74 million c.ft. having been produced as against 17½ million c.ft. during the previous year. Increased expenditure to the extent of £2395 had been incurred in respect of materials, salaries, and wages for manufacture, distribution, and repairs, and to management and establishment charges. Rates and taxes were up by £151, and renewals contributions by £205, while there had been decreased expenditure in loan charges of £211, and public lamp maintenance £259. Turning to the income side of the accounts, the sale of gas had produced £11,222 more than the previous year; £2550 of this being due to the increase of 6d. per 1000 c.ft. from December, 1926. The balance was the result of increased sales. With regard to the income from the sale of residuals, coke had realized £3645, and tar and ammoniacal liquor £2670 more than the previous year, owing to increased makes and prices. Under this head, he would mention that the reduced price charged for coke supplied to unemployed persons represented a concession during the year of £1414, as compared with £803 for the previous year, making a total allowance in this respect of £4375 for the four years during which the scheme has been in operation. The result of the years' working of the Gas Department, after setting aside the sum of £10,428 for the renewal of works and plant, was a gross profit of £2946. After paying interest on mortgages, &c., of £6740, and sinking fund contributions of £8095, there was a net loss of £11,889.

The condition of the gas-works at present was giving considerable anxiety, and in the near future the Council would have to consider centralization of the works, either in Hindpool Road or at Salthouse. The matter had been mentioned by the Manager in his report year after year; and it would have to be dealt with by the Council shortly.

SHANGHAI GAS COMPANY, LTD.

The Annual General Meeting of the Company was held in Shanghai on March 24, and was presided over by the Chairman (Mr. L. E. Canning, O.B.E.), who said the output of gas showed a marked improvement as compared with that of the previous year; the most noticeable feature being the increase in the number of Chinese consumers, which, since 1917, had been steadily decreasing. The gain in foreign consumers was even more satisfactory. The distribution of gas for industrial purposes was less favourable, due partly to the replacement of gas engines by other systems of power; while there was also a decrease in the public lighting. The gas sales showed an increase of 5·91 p.ct. over the previous year, which must be considered very satisfactory. During the past ten years wages and salaries had increased by no less than 91·31 p.ct. In addition, as from Feb. 1 last, wages of workmen had been increased by 15 and 20 p.ct. The coal supplies for 1927 would show an increased cost over 1926 of 25·44 p.ct., *plus* the new surtax. An adjustment in the selling price of gas had been necessary to help to counterbalance these abnormal advances.

"Before closing," said the Chairman, "I should like to refer to the reign of terror—I can call it nothing else—existing in the Settlement. There is undoubtedly some organization at work here shooting not only Chinese foremen and supervisors, but their wives; and this is creating an absolute panic among that class of workman who comes in touch with the foreigner. It is very hard to make any suggestion to combat such dastardly deeds. I, and I may add my colleagues of the Board, have every admiration for the members of our police force; but some very concerted action will have to be taken, and taken quickly, to allay the fear from which foremen and supervisors are now suffering."

The Chairman acknowledged the indebtedness of the Company to Mr. F. W. Potter (Engineer-in-Chief), Mr. W. Gater (Secretary), and their respective staffs, and announced that they were losing the services of Mr. J. W. Mackay (Deputy Engineer), who had been with them for nearly nineteen years.

TRADE NOTES.

"A. & M." Pressure Wave Controllers for Dukinfield.

The Borough of Dukinfield have decided to fit up a complete installation of "A. & M." pressure wave controllers, representing a total number of 540 lamps. The installation is to be in readiness for the commencement of next lighting season. For operating the system they have decided to instal a Bryan-Donkin fan booster.

Removal.

In view of their need of more commodious premises, Messrs. Glover & Main, Ltd., and their allied Companies, Messrs. Thomas Glover & Co., Ltd., and Messrs. R. & A. Main, Ltd., have acquired 48, Grosvenor Gardens, London, S.W. 1. They will be moving from their present address, 38, Grosvenor Gardens, as soon as the alterations are completed at their new premises.

Purifiers for the "South Met."

Messrs. Ashmore, Benson, Pease & Co., Ltd., of Stockton-on-Tees, have received instructions from the South Metropolitan Gas Company to supply and erect at their Rotherhithe Works a steel building 152 ft. long in three bays of 30 ft. 8 in., with substructure, revivifying floor, and roof, and 12 purifiers, 35 ft. by 27 ft. 7½ in. by 9 ft. 6 in., of the luteless type, fitted with 24 steel covers, 24 in. diameter gas and air mains and connections, and water valves.

Gas Cooking Apparatus for Hotels, &c.

Messrs. William Sugg & Co., Ltd., of Westminster, are to be congratulated on the high standard of the booklet which they have published dealing with gas cooking appliances for hotels, restaurants, and institutions. The illustrations are excellent and the descriptions of the various apparatus clear and complete. Messrs. Sugg make a speciality of such appliances, numerous examples of which will be displayed in their new and extensive showrooms which will be opened this month.

Keith Fans.

A folder showing how one can readily, and at little cost, ensure a constant supply of fresh air into any building or room, or department of a building, has been received from the James Keith and Blackman Company, Ltd., of 27, Farringdon Avenue, London, E.C., who make fans for ventilating and all other purposes. Hundreds of thousands of Blackman ventilating fans are already in use, running many hours a day, year in and year out, without requiring any attention beyond occassional oiling.

"Victaulic" Pipe Joints.

The Victaulic Company, Ltd., King's Buildings, Dean Stanley Street, Millbank, S.W.1, are issuing a new catalogue. In this an effort has been made to describe fully the functioning of the "Victaulic" joint and the best method of using it on gas lines, &c., in

order to obtain most benefit in regard to the saving of money and time. Particulars of new fittings and joints—some mentioned for the first time—are given in the catalogue. For example, the subsidence joint, which allows pipes to pull apart up to 3 ft. without leakage; "closer" joints for "closing-in" pipelines without workshop aid; adjustable bends which give any required angle from 0° to 45°; plug-in joints for tapping mains; setting pieces; short reducers; valve-flange joints, &c. The new fittings are intended to eliminate "specials" and template pipes, and their use reduces the cost of pipelines, and saves much time. An important announcement in the catalogue is that referring to the firm's adoption of steel alloy. This material has an ultimate tensile strength of 22 to 24 tons, and a minimum elongation of 6 p.ct. A bar can be bent cold through an angle of 180°. Joints are now supplied at the same prices in this material, instead of in semi-steel and cast iron.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The Whitsun holiday will come as a welcome respite to a great many collieries which are finding difficulty in disposing of even limited outputs. Nevertheless, the week has not been altogether devoid of good points, and the demand for prompt coals has, if anything, been slightly better than of late. The holiday, while not by any means causing the usual rush for coal, has induced a certain amount of buying. Another factor has been the decree of the French Government prohibiting the import into France after June 5 of any coal except under license. There has naturally been some anxiety to complete shipments before that date. If the decree is strictly enforced, the effect will be serious for Durham, which normally sends large quantities of gas and coking coals to French ports.

The generally low range of prices now quoted does not appear to attract forward business, and markets have so far gone so consistently in favour of buyers, that they hesitate to cover requirements ahead. Wear Special gas makes quote 16s. 6d. to 17s. f.o.b., and best qualities are about the same. Seconds are nominally 14s. 3d. to 14s. 9d., but for the present they are mostly accepting 14s. or even slightly below that figure. Good Durham unscreened coking coals and ordinary bunkers are obtainable at 14s. f.o.b. Northumberland steams remain weak, with nothing like enough trade offering.

Gas coke for shipment is quoted at 19s. 6d. to 20s. f.o.b.

YORKSHIRE AND LANCASHIRE.

Although collieries in Yorkshire and Lancashire are closed for a greater portion of this week, there was no increase of business last week. Industrial coals moved slowly, with some collieries having accumulated stocks, there being no appreciable response to low current and spot prices. The market for domestic fuel was particularly quiet, although some low prices were taken for prompt sales.

There was no sign of a revival in the export trade, although low figures are operating, and it is apparent that serious attention must be given to the recently increased railway rates to the ports, as these are said to have placed an undue burden on the coal trade, taking into account foreign competition.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 16s. to 16s. 6d.; screened gas coal, 16s. to 16s. 6d.; washed trebles, 16s. to 16s. 9d; washed doubles, 16s. to 16s. 6d.; washed singles, 16s. to 16s. 6d.; washed smalls, 14s. 3d. to 14s. 9d.; rough slack, 13s. 9d. to 14s.; smithy peas, 18s. to 19s. per ton. West Yorkshire Hartley's (f.o.b. Goole), 15s. to 16s.; screened gas coal, 15s. to 16s.; washed trebles, 15s. to 16s.; washed doubles, 15s. to 16s.; washed smalls, 14s. to 14s. 3d.; unwashed trebles, 14s. 9d. to 15s. 6d.; unwashed doubles, 14s. 6d. to 15s. 3d.; rough slack, 13s. 3d. to 13s. 9d.; coking smalls, 13s. per ton. Derbyshire and Nottinghamshire—Top hards, 17s. 6d. to 19s.; washed doubles, 16s. to 16s. 6d.; washed singles, 16s. to 16s. 6d.; washed smalls, 14s. to 15s.; unwashed doubles, 15s. to 16s.; rough slack, 13s. to 14s. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 14s. 6d. to 15s. 6d.; gas coke, 21s. to 25s.; furnace coke, 17s. 6d. to 18s. per ton.

MIDLANDS.

Marketing conditions are so confused that there is nothing like a uniform lowering of prices to the summer level. Few new price-lists have been issued this month by Midland collieries. Most of them took the view that it was better to curtail output in correspondence with the shrunken demand than to attempt to re-animate a dead market by price concessions at a time when in the nature of things no new vitality was to be expected. Moreover, prices have already been reduced below the economic point in many cases.

Values are still drooping, of course, but formal revisions are few. Spot lots are obtainable at specially low prices. With the efforts made to avoid over-production, forced sales are not so numerous as to disorganize the market greatly. Consumers are being urged to avail themselves of present prices to put down winter stores. Plenty of deep coals suitable for stacking—some weather-proof and many more which can be guaranteed against disintegration if put under cover—are being offered. The public are waiting, however, for the chance of buying at still lower prices, heedless of the risks threatened by a simultaneous rush for winter supplies after the summer holidays. High grade house coals are quoted 28s. to 33s. at the pithead.

There is no material development with regard to industrial qualities. Bakers' nuts are coming forward much faster than they can be absorbed. A very wide range of prices prevails, descending from 24s. to as low as 12s. 6d. D.S. nuts realize 14s. upwards, and slacks from 8s. 6d. to 11s.

POSITIVE RECORD

GAS CALORIMETER

(Simmance's Patent)

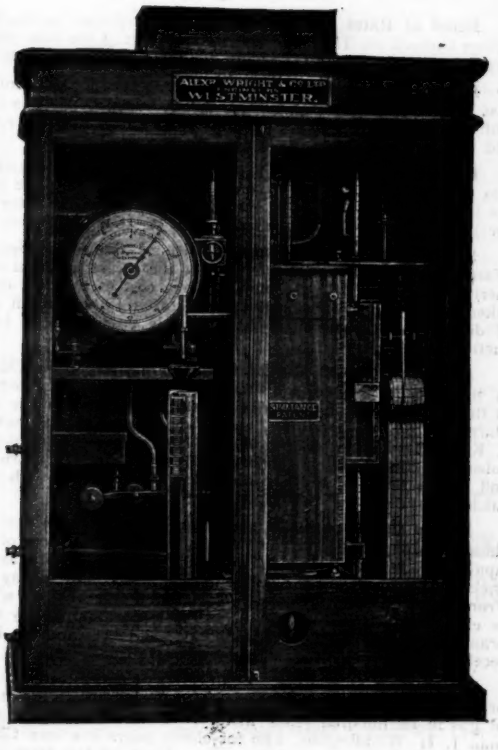
ACCURATE

No Water Troubles.

CERTAIN for a LONG RUN without attention.

A PERFECT TEST INSTRUMENT.
A PERFECT RECORDING MACHINE.
AN AUTOMATIC TESTER.

Maintenance Expense Avoided.



ALEXANDER WRIGHT & CO., Ltd., Westminster, S.W.1

Telephone: VICTORIA 1207. Telegrams: PRECISION, SOWEST, LONDON.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *June* 4.

The market for pitch continues steady at about 75s. to 80s. per ton. There are still a few belated orders for prompt shipment, and a moderate amount of inquiry for next season.

Creosote remains steady at 8¾d. to 9d. per gallon.

Pure toluole is 1s. 10d. to 1s. 11d. per gallon, pure benzole 1s. 7d. to 1s. 8d. per gallon, and 95/160 solvent naphtha 1s. 5d. to 1s. 6d. per gallon.

Phenol is about 8¼d. per lb.

Tar Products in the Provinces.

June 6.

The average values of gas-works products during the week were: Gas-works tar, 54s. 6d. to 59s. 6d. Pitch—East Coast, 70s. to 75s. f.o.b. West Coast—Manchester—67s. 6d. to 74s. 6d.; Liverpool, 70s. to 75s.; Clyde, 72s. 6d. to 75s. Benzole, 90 p.ct. North, 1s. 5d. to 1s. 6d.; crude, 65 p.ct. at 120° C., 1s. 0¼d. to 1s. 0¾d., naked, at makers' works; 50-90 p.ct. naked, North, 1s. 6d. to 1s. 7d. Toluole, naked, North, 1s. 6¼d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7¼d. to 8d. Solvent naphtha, naked, North, 1s. 2¼d. to 1s. 3¾d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, in bulk, North, liquid, 7¼d. to 7¾d.; salty, 7¼d. to 7½d.; Scotland, 7½d. to 7¾d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 6d. prompt. Naphthalene, £11 to £14; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Sulphate of Ammonia.

Nitram, Ltd., ask us to note that they have decided to continue selling sulphate of ammonia for home agricultural use until further notice at the current prices of £12 6s. per ton for neutral quality, and £11 16s. per ton for ordinary quality, delivered carriage paid in 4-ton lots and upwards to buyer's nearest station, or *ex* works in 1-ton lots and upwards.

CONTRACTS OPEN.

Coal.

The Birstall Urban District Council are inviting tenders for the supply of gas coal. [See advert. on p. 646.]

The Carnarvon Gas Committee are inviting tenders for the supply of gas coal. [See advert. on p. 646.]

Mantles and Crutches.

Tenders are invited by the Plymouth Corporation for the supply of incandescent mantles and crutches. [See advert on p. 646.]

Pipes.

The King's Lynn Rural District Council are inviting tenders for the supply of cast-iron pipes and specials. [See advert. on p. 646.]

Relief of Rates at Coalville.—It was reported to the Coalville Urban Council on Thursday last that another £500 had been transferred from the gas-works account for the relief of the rates.

Loss at Brighouse.—The Brighouse Corporation accounts for the past year show a loss of £1300 on the Gas Department, as compared with a profit of £102 in the previous year. More than £12,000 extra had to be paid for coal.

Reduction at Kettle.—The Directors of the Kettle and District Gas Company, Ltd., Fife, have decided to reduce the price by 1s. 3d. per 1000 c.ft. This brings the charges to the pre-strike rates of 6s. 3d. per 1000 c.ft. for domestic purposes and 5s. 10d. for power.

Spenborough Council Reduces Price of Gas.—The Spenborough District Council last week agreed that the recent addition of 2d. per therm in the price of gas, owing to the cost of the coal dispute, be taken off as from the first meter reading after July 1, and in the course of discussion it was hinted that there is possibility of further reduction.

Alleged Attempted Murder by Gas Poisoning.—The Magistrates at the last Petty Sessional sitting at Mansfield committed for trial at the ensuing Nottinghamshire Assizes, which open on the 20th inst., Harry Jefford, 33, a painter, and Mary Bentley, his housekeeper, of 4, Keir's Buildings, Mansfield, for attempting to murder by gas poisoning three young children, Douglas Jefford, Eric Jefford, and Bessie Bentley; the accused being also charged with attempted suicide.

Paying Gas Accounts at the Bank.—It is reported that the Manchester Corporation have completed a scheme with three of the principal banks in the city which will relieve consumers of gas and electricity of the necessity for going to the Town Hall to pay accounts. From next quarter day it will be possible for anyone with a gas or electricity account with Manchester Corporation to pay the bill at branch offices of the District, Midland, and Westminster Banks. A receipt will be given, as at the Town Hall.

Celebration at Halifax.—Halifax Gas Committee last week celebrated the fact that the Department had reached its greatest output of gas in its hundred years' history. The record output, said Alderman J. H. Waddington, who for eleven years has been Chairman of the Committee, was 906,000,000 c.ft. They got this from 50,000 tons of coal carbonized, whereas when he became Chairman the works were carbonizing 70,000 tons of coal a year to get 826,000,000 c.ft. of gas. The improvement was a great tribute to the outstanding ability of their Engineer and Manager (Mr. W. B. McLusky). The Mayor suggested that this great increase in gas yield from 20,000 tons less of coal justified their new vertical plant.

Gas Forges Ahead at Camborne.

The popularity of gas in connection with housing schemes has recently been amply exemplified at Camborne, where the Urban District Council have accepted the Gas Company's tender for installing gas in fifty houses now in course of erection. Though the tender of the Electricity Company was lower than that of the Gas Company, the latter's tender was accepted for the whole of the work. This decision speaks volumes for the wisdom of the local councillors, who are fully alive to the advantages of gas over electricity for domestic purposes. The contract is for nine points in each of one class of house, and seven points in each of the other houses, including the provision of pendants, brackets, burners, &c. Supplies will also be laid on for gas cookers, fires, geysers, and wash-boilers. The Camborne Gas Company have just completed installations in 25 houses built privately for a local firm. These installations, following the securing of the contract for the public lighting of the town and district for a term of ten years, augurs well for the continued prosperity of the Camborne Gas Company's undertaking.

Cheaper Gas at Dewsbury.—The Dewsbury Town Council have sanctioned a reduction in the price of gas for lighting purposes from 5s. to 4s. 2d. per 1000 c.ft.

Reduction in Price at Carlisle.—The price of gas in Carlisle will be reduced by 6d. per 1000 c.ft. after the June meter readings. The net profit for the past financial year amounts to £790.

Gosport Company's Mortgage Bonds.—An issue of £9700 of 5 p.ct. redeemable mortgage bonds is being made for the Gosport District Gas Company by Messrs. A. & W. Richards, of 37, Walbrook, E.C., to whom tenders are to be sent by Tuesday morning, June 21. The bonds are redeemable at par on Jan. 1, 1936; and the minimum price at which they will be issued is £95 per £100. The Company's rapidly growing business received a further impetus when the Fareham area was added in 1925.

Spalding Gas-Works Loan Refused.—The Spalding Urban District Council have been informed that the Minister of Health has refused to sanction the borrowing of £33,577 for proposed improvements and extensions at the gas-works, on the ground that the scheme as submitted would create a very serious financial burden. He suggests that the Council ask their engineers to reconsider the scheme, with a view to effecting some reduction in cost. The Council decided to engage another engineer to report on the scheme.

Gas Exhibition at Carmarthen.—On May 30 the Mayor of Carmarthen, Alderman Walter Spurrell, J.P., opened a successful gas exhibition at St. David's Memorial Hall, staged by the Carmarthen Gas Company. Dr. L. M. Bowen-Jones, Chairman of the Company, presided. The Mayor, in declaring the exhibition open, said that the old town of Carmarthen was not far behind the larger towns in adopting gas for public lighting, and in 1822 the first installation of eighty lamps was made. He emphasized the importance of the by-products of carbonization.

Satisfactory Results at Abertillery.—It was reported at a recent meeting of the Abertillery Urban District Council that the net profit of the gas undertaking for the year ended March 31 last was £1700. The quantity of gas made was 81,965,000 c.ft., a decrease of 3·7 p.ct.; the quantity of coal carbonized being 5512 tons. The Council resolved to allocate £1700 to the relief of rates, and to reduce the price of gas as from July 1 by 1d. per therm, equal to 4·3d. per 1000 c.ft. The Engineer and Manager (Mr. I. G. Jenkins) was congratulated on the satisfactory results of the year's trading.

Whessoe Foundry and Engineering Company, Ltd.—Addressing the shareholders at the seventh annual meeting, Mr. Harold J. Judd, C.B.E. (the Chairman), said the report and accounts (*ante*, p. 586) must be regarded as satisfactory, especially in the circumstances of the past year. Alterations made had greatly improved the efficiency of the works. The financial position of the Company was exceptionally strong. Acknowledgment was made by him of the excellent service rendered to the Company by Mr. Hodgson, the Managing Director, Mr. Spielman, the General Manager, and all the members of the staff. The dividend was at the rate of 10 p.ct., less income-tax.

Low-Temperature Carbonization, Ltd.—The Directors of Low-Temperature Carbonization announce the successful completion and lighting-up of the first of five batteries of retorts for the large-scale commercial production of "Coalite." The remaining batteries are said to be nearing completion, and when lit-up will form a complete plant of four batteries in day and night operation, and one in reserve, with a throughput of 200 tons of coal per day. The Directors are satisfied with the progress made at Barugh, and intend to draw-up a full report in the autumn. They state that the Company is possessed of ample cash resources to continue the development of its process.

Bideford Gas and Coke Company, Ltd.—Submitting to the shareholders the accounts for the year ended March 31, the Directors stated that the profit and loss account, after providing for the interim dividend, &c., showed a balance, including the amount brought forward, of £3705, out of which the Directors recommend a final dividend on the original shares of 7½ p.ct., and on the additional shares at 6 p.ct., making for the year 14 p.ct. on the original shares and 11 p.ct. on the additional shares. This would leave £2483 to be carried forward. The business of the Company continues to make satisfactory progress—the sales of gas showing a considerable increase. Owing to the high cost of imported coal, it was found necessary to increase the price of gas from 9d. to 10d. per therm from the Michaelmas quarter; but there is a reversion to the former price of 9d. per therm as from the Lady-day readings of the meters. During the year 400 £10 new additional shares were issued; and an average price of £16 17s. 9d. per £10 share was realized.

STOCK MARKET REPORT.

With the attraction of the Epsom meeting and the approaching Whitsuntide holidays, business on the Stock Exchange last week was, as expected, extremely quiet. The disbursement of the War Loan interest on Wednesday had a mildly stimulating effect on gilt-edged securities, which otherwise would have been depressed by the further withdrawal of gold from the Bank of England. The position in China again affected the Foreign Market, and Chinese, Japanese, and French loans all declined. Some of the Egyptian bonds also weakened on the friction with the British Government. It is stated that the Bradford Corporation issue was satisfactorily floated, but dealings took place at $\frac{5}{8}$ and $\frac{3}{16}$ discount.

The only real activity was in Industrial specials. In Artificial Silks Courtaulds were most prominent, and the insistent demand left the market in danger of a shortage. Other shares sought for were Textiles, Tobaccos, Shipping, and Catering. Oils were neglected in spite of the excellent report of the Burmah Company.

The Gas Market was obviously affected by the holiday atmosphere, and the business done was less than usual. There were no important changes in the quotations, except the drop of 2 points in the three Sheffield stocks. It is a little surprising that these stocks, which have paid the same dividend and have been of equal value for many years, have not been consolidated.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. June 3.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C.	70—78	..	..
223,992	,,	,,	4	4	Do. 4 p.c. Pref.	65—71	..	..
1,551,868	,,	Apl. 7	6½	7	Alliance & Dublin Ord.	84—87	+1	85—85½
274,000	,,	Jan. 13	4	4	Do. 4 p.c. Deb.	65—68	..	66
300,000	1	Apl. 28	1/7½	1/7½	Bombay, Ltd.	1—1½	..	..
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
600,050	10	,,	7	7	Do. B 7 p.c.	11½—12½	..	11½
275,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11½	..	11½
50,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb.	53—56	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
367,900	,,	—	—	—	Brighton & Hove 6 p.c. Con.	102—107	..	..
341,800	,,	—	—	—	Do. 5 p.c. Con.	90—95	..	..
1,327,500	,,	Feb. 24	5	5	Bristol 5 p.c. max.	89—90a	..	..
855,000	,,	Mar. 24	8	7	British Ord.	106—109	..	..
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref.	112—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	..	75½—76½
100,000	10	May 26	6	5	Cape Town, Ltd.	7½—8½	..	..
100,000	10	Apl. 28	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
180,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb.	70—75	+2	70
686,880	,,	Feb. 24	6	6	Cardiff Con. Ord.	99—103	..	..
287,880	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb.	100—108	..	..
187,150	,,	Feb. 24	5	5½	Chester 5 p.c. Ord.	86½—91½b	..	..
79,185	1	Apl. 28	†2/-	†2/-	Colombo Ltd. Ord.	26/—28/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
231,490	1	Apl. 7	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	26/-
178,900	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-	..	..
1,518,380	Stk.	Feb. 24	5½	5½	Commercial 4 p.c. Cap.	86—89	..	88
560,000	,,	,,	5/3/4	5/3/4	Do. 3½ p.c. Cap.	85—88	..	87
475,000	,,	Dec. 30	3	3	Do 3 p.c. Deb.	56—59	..	..
900,000	,,	Sept. 30	‡2	‡1	Continental Union, Ltd.	32—37	..	..
200,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref.	79—82	..	..
787,560	,,	Mar. 10	6½	6½	Croydon sliding scale	96—99	..	97½
408,100	,,	,,	5	5	Do. max. div.	77—80	..	..
492,270	,,	Feb. 24	6	9	Derby Con.	104—106e	..	..
55,000	,,	Dec. 30	4	4	Do. Deb.	78—75e	..	..
209,000	,,	Mar. 10	5	5	East Hull Ord. 5 p.c.	76—80	..	..
50,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb.	92—97	..	..
1,009,180	10	Mar. 24	†3	†3	European, Ltd.	6½—7½	..	6—6⅝
18,747,450	Stk.	Feb. 10	5/1/4	5	Gas Light & Coke 4 p.c. Ord.	86½—88½	..	87—88
2,000,000	,,	,,	3½	3½	Do. 3½ p.c. max.	59—61	..	60—61
4,137,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—78	..	76½—77½
5,602,620	,,	Dec. 30	3	3	Do. 3 p.c. Con. Deb.	58—60	..	59—59⅝
181,815	,,	,,	—	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	..
1,642,770	,,	,,	—	5	Do. 5 p.c. Red. Deb.	99—101	..	101
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 10	6½	6½	Hastings & St L. 5 p.c. Conv	90—92	..	..
268,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	67—72	..	..
70,000	10	Apl. 28	†10	†10	Hongkong & China, Ltd.	12—18	..	..
178,200	Stk.	Mar. 10	5	5	Hornsey Con. 3½ p.c.	67—69	..	..
1,976,000	,,	May 12	10	10	Imperial Continental Cap.	137—141	..	137½—139
233,130	,,	Feb. 10	3½	3½	Do. 3½ p.c. Red. Deb.	69—71	..	70
385,242	,,	Mar. 10	6½	6½	Lea Bridge 5 p.c. Ord.	92—97	..	..
3,148,967	,,	Feb. 24	5½	5½	Liverpool 5 p.c. Ord.	84—85b	..	..
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	102—104b	..	..
165,788	,,	Feb. 24	9	8	Maidstone 5 p.c. Cap.	110—115	..	..
68,480	,,	Dec. 30	3	3	Do. 3 p.c. Deb.	52—57	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean	5½—5¾	..	..
641,920	Stk.	May 26	†5	†7	Montevideo, Ltd.	87—92*	+2	90—91
2,061,815	,,	Feb. 24	5	5	Newcastle & Gateshead Con.	75—76d	..	..
260,929	,,	,,	4	4	Do. 4 p.c. Pref.	68—69d	..	..
691,705	,,	Dec. 30	3½	3½	Do. 3½ p.c. Deb.	68—69d	..	..
131,785	,,	—	—	—	North Middlesex 6 p.c. Con.	91—93	..	..
200,000	,,	Apl. 28	9	7	Oriental, Ltd.	97—102	..	..
188,120	,,	Dec. 30	7½	7½	Plym'th & Ston'house 5 p.c.	105—110	..	..
414,500	,,	Feb. 24	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	100—105	..	..
296,732	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	..
2,289,909	1	—	—	—	Primitiva Ord.	14/—15/-	..	14/3—14/9
282,200	100	June 1	4	4	Do. 4 p.c. Red. Deb.	84—86*	−1	..
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	..	..
434,968	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb.	70—72	..	..
150,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref.	7½—7¾	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	..
270,000	Stk.	Mar. 24	5½	5½	Sheffield A	98—100	−2	..
419,968	,,	,,	5½	5½	Do. B	98—100	−2	..
1,047,000	,,	,,	5½	5½	Do. C	98—100	−2	..
90,000	10	May 26	4	6	South African	4—6*	..	..
6,809,895	Stk.	Feb. 24	5	7	South Met. Ord.	100—102	..	100½—102
1,895,445	,,	Jan. 13	3	3	Do. 3 p.c. Deb.	57—60	..	58½—59½
734,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	..
91,500	,,	Feb. 24	8½	8½	South Shields Con.	104—106d	..	..
1,343,725	,,	Mar. 10	6½	6½	South Suburban Ord. 5 p.c.	103—106	..	103—105
368,807	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	94—97	+1	96
647,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	74—77	..	76½
121,275	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—73	..	..
350,000	,,	Feb. 24	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,000	,,	Feb. 24	7½	7½	Tottenham District A 5 p.c.	105—110	..	..
889,575	,,	,,	6½	6½	Do. B 3½ p.c.	90—93	..	..
180,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,156	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
258,251	,,	Mar. 10	5	5	Tynemouth Con. and New	71—72d	..	..
197,304	,,	Mar. 10	8½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	85—90	..	..
88,352	,,	,,	5	5	Do. 5 p.c. pref.	83—88	..	..
91,900	,,	,,	6½	6½	Do. 5 p.c. Maidenh'd	83—88	..	..
30,600	,,	Mar. 10	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	120—125	..	..
355,866	,,	,,	7	7	Do. B 3½ p.c.	102—107	..	..
432,135	,,	,,	5/19/0	5/19/0	Do. C and New	90—95	..	..
362,000	,,	,,	6½	6½	Wimbledon 5 p.c.	98—103	..	..
98,000	,,	,,	7½	7½	Epsom 5 p.c.	103—108	..	..
88,416	,,	Dec. 30	3	3	3 p.c. Deb.	54—57	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. * Ex. div. † Paid free of income-tax. ‡ For year.

On Monday, British 4 p.c. deb. 75½, 76½, Commercial 3½ p.c. 87, European 6½, Gas Light and Coke 87, 87¼, 87⅜, 87½, 87¾, 3½ p.c. 60½, 4 p.c. pref. 76½, 77¼, 3 p.c. deb. 59¼, 5 p.c. deb. 101, Primitiva 14s. 4½d., 14s. 6d., 14s. 7½d., South Metropolitan, 100½, 100⅝, 101, 101½, 101⅝, South Suburban 5 p.c. 104, Southampton 5 p.c. 76¾. Supplementary prices, North Middlesex 4 p.c. deb. 71, 71½, Oxford 5 p.c. 129.

On Tuesday, Alliance and Dublin 85, 85½, 85¼, Colonial 26s., European 6⅜, Gas Light and Coke 87, 87½, 87¼, 87⅝, 3½ p.c. max. 60, 61, Imperial Continental 137½, 138, 139, 3½ p.c. deb. 70, Primitiva 14s. 4½d., 14s. 7¼d., South Metropolitan 101, South Suburban 5 p.c. 103, 104¼, 104¾, 105. Supplementary prices, Cheltenham 5 p.c. max. 76½, Gloucester 87½, Liverpool 5 p.c. 84¼.

On Wednesday, Alliance and Dublin 85, 85½, 4 p.c. deb. 66, Bournemouth 6 p.c. pref. 11½, Cape Town and Dist. 4½ p.c. deb. 70, Croydon sliding-scale stock 97½, Gas Light and Coke 87, 87⅜, 87¾, 4 p.c. pref. 76½, 3 p.c. deb. 59¼, Imperial Continental 138, Montevideo, 90, 91, Primitiva 14s. 7½d., South Metropolitan 100½, 101, 101⅛. Supplementary prices, Bournemouth 7 p.c. deb. 104, 104½, Liverpool 5 p.c. 84¼.

On Thursday, Commercial 4 p.c. 88, Gas Light and Coke 87⅛, 88, 3½ p.c. 60½, 4 p.c. pref. 76¾, 3 p.c. deb. 59, 59⅜, Imperial Continental 137½, 139, Primitiva 14s. 3d., 14s. 4½d. 14s. 6d., 14s. 7½d., 14s. 9d., South Metropolitan 100½, 101⅛, 101¼, 101¾, 3 p.c. deb. 58⅜, 58¾. South Suburban 104½, 5 p.c. deb. 96. Supplementary prices, Crowborough 66½, Hartlepool 5 p.c. 84½, 84¾.

On Friday, Gas Light and Coke 87½, 87⅞, Imperial Continental 138, Primitiva 14s. 4½d., 14s. 6¾d., South Metropolitan 101¼, 101½, 102, 3 p.c. deb. 59, 59½. Supplementary prices, Brighton and Hove 6 p.c. "B" pref. 103½, Hartlepool 5 p.c. max. 84½, 84¾.

Lombard Street benefited by the War Loan interest distribution on Wednesday, and rates of old and new loans dropped appreciably; the latter being made at as low as 3 p.c. The Discount Market was firmer again, particularly after the allotment of the Treasury Bills, which averaged £4 7s. 1·56d. p.c.—a further rise of 9·68d. p.c., and the highest rate since March 18.

In the Foreign Market interest was centred in the New York rate, which continued to move against sterling, the quotation, after a recovery of ⅛, closing at 4.85⅝. The French rate was unaltered at 124. A reaction took place in Italian lire, the Milan rate being 1 higher at 87½. The Dutch rate moved against this country in sympathy with the New York rate, and closed at 12.12½. Pesetas were cheaper at 27.70; but Belgas remained unchanged at 34.96½.

Silver recovered $\frac{3}{16}$d. to 26$\frac{7}{16}$d. per oz. on Chinese buying; but Gold remained at the nominal price of 84s. 11½d. per oz.

The Bank Rate is 4½ p.c., to which it was reduced from 5 p.c. on April 21. Bankers' deposit rates are 2½ p.c. The deposit rates of the discount houses are 2½ p.c. at call and 2¾ p.c. at notice.

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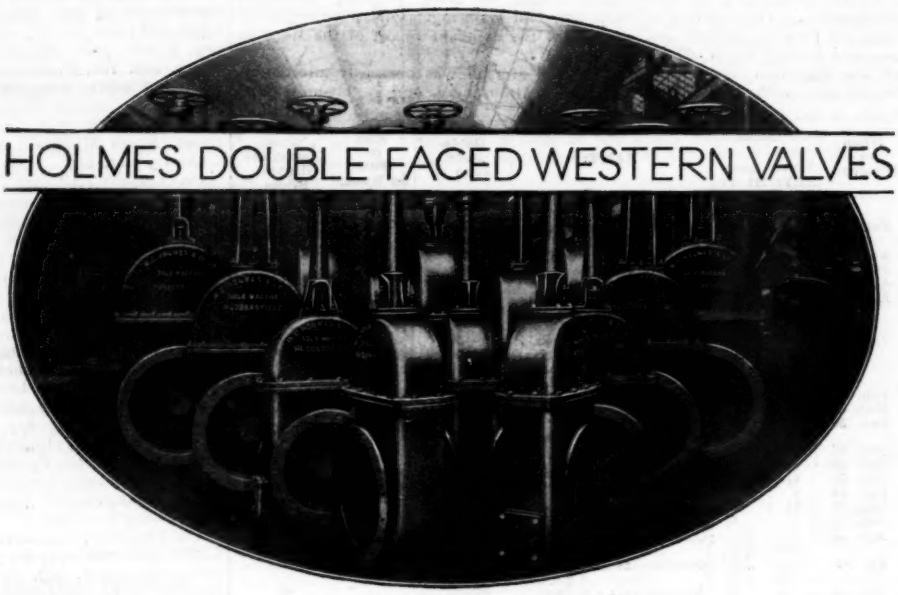

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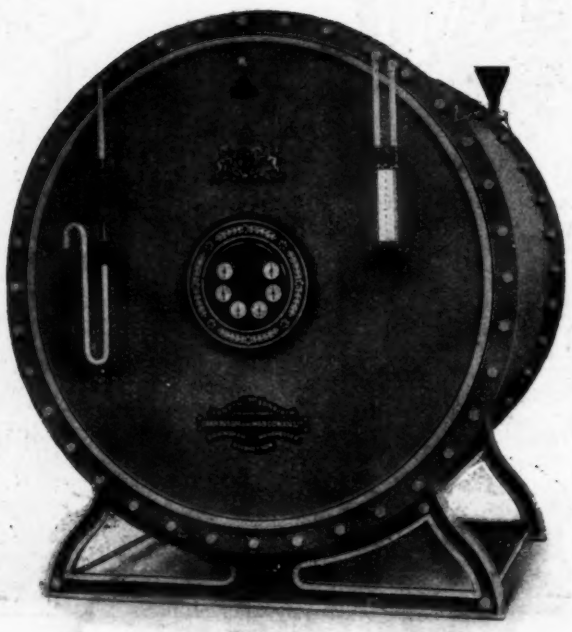

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